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THE BRITISH JOURNAL

PHOTOGRAPHIC ALMANAC

AND

Photographer's Daily Companion

FOR

1888.

EDITED BY J. TRAILL TAYLOR.

For Contents Index *see page* 565.
For Advertisers' Index *see page* 583.
For Postal and Telegraphic Addresses *see page* 688.

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PREFACE.

The year now drawing to a close finds the Photographic Art-Science in a higher state of perfection than at its advent, and in the following pages will be found, contributed by numerous cultured writers, articles of the most richly practical and theoretical nature.

After due consideration it has this year been determined to depart from the usual time-honoured system of paging this Annual, and to adopt, by preference, a continuous numerical system from beginning to end, which, it is believed, will prove acceptable.

Two Pictorial Illustrations are given, one being of the at present famous yacht *Thistle*, printed by Messrs. Morgan & Kidd on their Argentic Bromide Paper from a Negative by Mr. A. H. Clark; the other being a Collotype by Messrs. Waterlow & Sons, from a Negative by Mr. J. B. B. Wellington on a Pall Mall Plate, entitled '*You Naughty Boy!*'

The various Tables and Formulæ are corrected up to date.

To the able staff of friends, skilled experimentalists, and accomplished photographers, by whose contributions this volume is so greatly enriched, I tender my thanks and dedicate the Annual.

J. Traill Taylor,

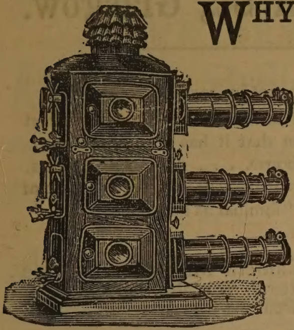
Editor.

2 York Street, Covent Garden, W.C.

December 1, 1887.

For Contents, *see p.* 565.
For Index to Advertisers, *see p.* 583.
For Postal and Telegraphic Addresses, *see p.* 688.

MAGIC LANTERNS & SLIDES



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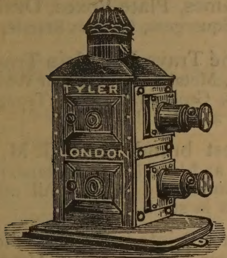

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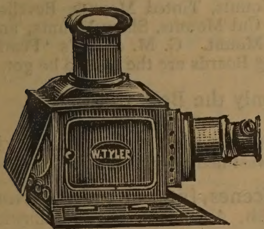

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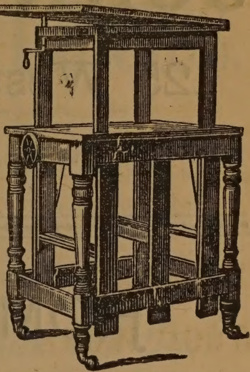

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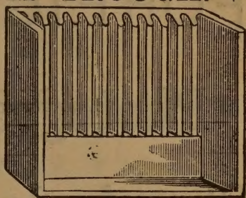
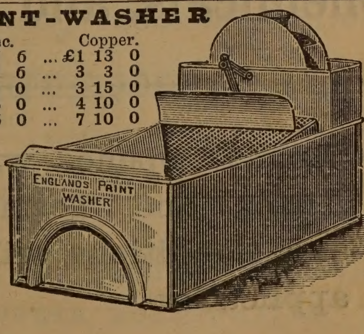
NEW FIXING OR ALUM TROUGH.



Sizes and Prices.	6 Grooves.	12 Grooves.	18 Grooves.
¼-plate	—	6/-	—
½ „	5/-	7/6	10/-
Whole-plate	9/6	12/6	—
10×8 „	12/6	—	—
12×10 „	17/6	—	—

From the cut the Profession will see at once the value of the Grooved Trough, as all flat dishes are dispensed with, and the operations of fixing and hardening the plate are conducted in much less space, and with greater safety.

ENGLAND'S PRINT-WASHER



PRICES.	Zinc.	Copper.
To take Prints up to 9 × 7	£0 17 6	£1 13 0
„ „ 13 × 11	1 17 6	3 3 0
„ „ 16 × 13	2 5 0	3 15 0
„ „ 20 × 16	2 15 0	4 10 0
„ „ 30 × 25	4 16 0	7 10 0

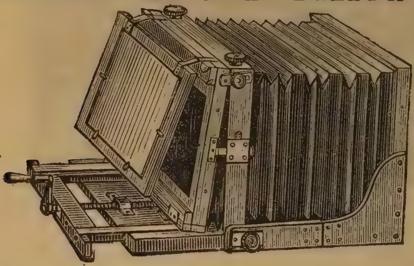
The Zinc Washing-Machines are japanned outside, and white enamel interior. They are fitted with syphon arrangement.

When Prints are being washed by this machine they are being perpetually shaken apart by the movements of the tray, and thus every part of the print gets washed, and it is almost impossible for two prints to stick together.

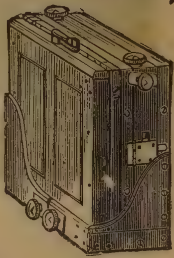
[*See pages* 211, 213, 215, 631, 633, 635, *and* 637.

H. MOORSE, Photo Apparatus Manufacturer to the Government.

IMPROVED PORTABLE BELLOWS-BODY CAMERA,



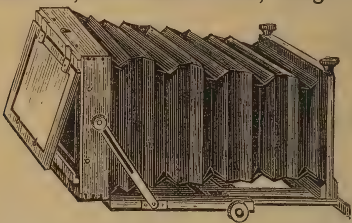
With Screw or Rack Adjustment, Swing Back and Single Back; Long Focus.

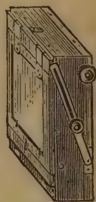


Size of Plates.	Length of Focus.	Spanish Mahogany.	Honduras Mahogany.	Extra Backs. Price.	If made square, with reversible frame, extra.
6½ × 4¾	4 × 16	£5 5 0	£5 0 0	£0 17 0	£0 12 0
7¼ × 4½	4 × 16	5 5 0	5 0 0	0 17 0	0 12 0
7½ × 5	4 × 16	5 10 0	5 5 0	0 18 0	0 12 0
8 × 5	4 × 17	5 15 0	5 10 0	0 18 0	0 12 0
8½ × 6½	4 × 18	6 10 0	6 0 0	1 2 0	0 15 0
9 × 7	4½ × 22	7 0 0	6 10 0	1 5 0	0 15 0
10 × 8	4½ × 42	8 0 0	7 10 0	1 10 0	0 15 0
12 × 10	5 × 24	10 0 0	9 10 0	1 17 0	1 0 0
15 × 12	5½ × 26	12 10 0	12 0 0	2 14 0	1 0 0

LIGHT CAMERAS,

For Amateurs, with Rack Pinion, Long Focus, and 1 Double Back.





Size.	Weight. lbs.	Length of Focus. Inches.	Size Closed.	Good Honduras Mahogany. Price.	Spanish Mahogany. Price.	Backs each. Price.
4¼ × 3¼	2½	12	2½, 6 × 6	£4 0 0	£4 6 0	£0 9 6
5 × 4	2½	13	2½, 7 × 7	4 5 0	4 12 0	0 10 0
6½ × 4¾	3½	16½	2¾, 8¾ × 8¾	5 0 0	5 10 0	0 14 0
7½ × 5	4½	18	3, 9¾ × 9¾	5 5 0	5 15 0	0 17 0
8 × 5	5	20	3, 10¼ × 10¼	5 10 0	6 6 0	0 17 0
8½ × 6½	5½	20	3, 10¾ × 10¾	6 0 0	6 15 0	1 0 0
9 × 7	6	22	3, 11¼ × 11¼	6 5 0	7 0 0	1 2 0
10 × 8	7	25	3¼, 12 × 12	7 0 0	7 15 0	1 4 0
12 × 10	12	27	3½, 14 × 14	7 10 0	8 10 0	1 10 0
15 × 12	17	30	4, 17½ × 17½	8 5 0	9 10 0	2 0 0

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[*See pages* 209, 213, 215, 631, 633, 635, *and* 637

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[*See pages* 209, 211, 215, 631, 633, 635, *and* 637.

[*See preceding pages.*

JANUARY.

D. M.	D. W.	Remarkable Events.	SUN. Rises. H. M.	SUN. Sets. H. M.	MOON. Rises. Morn.	MOON. Sets. After.
1	S	Sunday after Christmas	8 9	3 59	11 34	11 35
2	M	*Photographisches Archiv* f. 1860	8 9	4 0	11 56	Morn
3	Tu	Prof. J. W. Draper d. 1882	8 8	4 1	After	0 39
4	W		8 8	4 2	0 42	1 44
5	Th		8 8	4 3	1 10	2 50
6	F	☾ 11.43 M.	8 8	4 5	1 40	3 57
7	S	Daguerreotype com. to A. of Sc. 1839	8 7	4 6	2 22	5 4
8	S	1st Sunday after Epiphany	8 7	4 7	3 11	6 10
9	M		8 6	4 8	4 10	7 11
10	Tu		8 6	4 10	5 18	8 4
11	W		8 5	4 11	6 33	8 49
12	Th		8 4	4 13	7 53	9 27
13	F	● 8.39 M.	8 4	4 14	9 12	10 0
14	S	*Liverpool Photo. Journal* f. 1854	8 3	4 16	10 29	10 29
15	S	2nd Sunday after Epiphany. G. W.	8 2	4 17	11 47	10 57
16	M	[Simpson d. 1880	8 1	4 19	Morn	11 24
17	Tu		8 0	4 20	1 2	11 52
18	W	E. Lacan d. 1879. Reglander d. 1875	7 59	4 22	2 15	After
19	Th	Regnault d. 1878	7 58	4 24	3 26	0 56
20	F	Photo. Society of London f. 1853	7 57	4 25	4 32	1 36
21	S	Fox Talbot b. 1800 ☽ 4.49 M.	7 56	4 27	5 32	2 21
22	S	3rd Sunday after Epiphany. Sir W.	7 55	4 29	6 26	3 13
23	M	[Newton d. 1869. Mr. Burgess d. 1873	7 54	4 30	7 12	4 10
24	Tu		7 53	4 32	7 51	5 11
25	W		7 51	4 34	8 24	6 13
26	Th		7 50	4 36	8 53	7 16
27	F		7 49	4 37	9 17	8 20
28	S	Photo-sculpture pat. by Willème, '63	7 47	4 39	9 39	9 23
29	S	Septuagesima Sunday [○ 11.19 A.	7 46	4 41	10 0	10 26
30	M	Fox Talbot's first c. to Roy. Soc. 1839	7 45	4 43	10 22	11 29
31	Tu		7 43	4 44	10 45	Morn

JANUARY.

D. M.	D. W.	Meetings of Societies, &c.	Memoranda.
1	S	Sunday after Christmas	
2	M		
3	Tu	Bolton C., Sheff., Sutton, Paisley, N. Lon.,	
4	W	Ed. S., N. Staff. [Glos. D., Hlmfth., Cov., Car.	
5	Th	Bolton Soc., Dundee, Glasgow Am., Leeds	
6	F		
7	S		
8	S	1st Sunday after Epiphany	
9	M		
10	Tu	Gt. Britain, Newcastle, Manch. Am., Derby	
11	W		
12	Th	Birknhd., Bradford, Cheltenham, Halifax,	
13	F	Yorks. Coll., Ireland [Manchester Soc.	
14	S		
15	S	2nd Sunday after Epiphany	
16	M		
17	Tu	Notts, Glasgow Amateur, North London	
18	W	Bury, Edinburgh Club, Hyde, Manchester	
19	Th	[Club, Bristol	
20	F		
21	S		
22	S	3rd Sunday after Epiphany	
23	M		
24	Tu	Great Britain (Technical)	
25	W		
26	Th	Burton, Liverpool Am., Oldham, Halifax,	
27	F	[Yorkshire College	
28	S		
29	S	Septuagesima Sunday	
30	M		
31	Tu		

FEBRUARY.

D. M.	D. W.	REMARKABLE EVENTS.	SUN. Rises. H. M.	SUN. Sets. H. M.	MOON. Rises. Morn.	MOON. Sets. Morn.
1	W		7 41	4 47	11 10	0 33
2	Th		7 39	4 49	11 40	1 38
3	F		7 38	4 51	After	2 44
4	S	☾ 7.26 A.	7 36	4 53	0 58	3 49
5	S	Sexagesima Sunday. W. D.	7 34	4 54	1 50	4 52
6	M	[Sanderson d. 1885	7 33	4 56	2 53	5 48
7	Tu		7 31	4 58	4 5	6 38
8	W	Calotype Process pat. 1841	7 29	5 0	5 24	7 21
9	Th		7 27	5 2	6 45	7 57
10	F	Sir David Brewster d. 1868	7 26	5 4	8 8	8 29
11	S	● 11.53 A.	7 24	5 6	9 28	8 58
12	S	Quinquagesima Sunday	7 22	5 7	10 47	9 27
13	M	Leon Foncault d. 1868	7 20	5 9	Morn	9 54
14	Tu	St. Valentine	7 18	5 11	0 4	10 25
15	W	Oliver Sarony b. 1820	7 16	5 13	1 17	10 59
16	Th	Glasgow Photo. Society f. 1860	7 14	5 15	2 25	11 36
17	F	[portraiture) pat. 1857	7 12	5 17	3 27	After
18	S	Moule's Photogen (artificial light for	7 10	5 18	4 23	1 10
19	S	1st Sunday in Lent ☽ 1.59 M.	7 8	5 20	5 11	2 4
20	M	Poitevin's p. of Helioplastie pub. '55	7 6	5 22	5 51	3 3
21	Tu	Bingham d. 1870	7 4	5 24	6 25	4 4
22	W		7 2	5 26	6 55	5 7
23	Th		7 0	5 27	7 20	6 10
24	F		6 58	5 29	7 43	7 13
25	S	[Senefelder d. '34. Padre Secchi d. '76	6 56	5 31	8 5	8 16
26	S	2nd S. in Lent. Arago b. 1786.	6 54	5 33	8 28	9 19
27	M	○ 11.58 M.	6 52	5 34	8 50	10 23
28	Tu		6 49	5 36	9 14	11 27
29	W					

FEBRUARY.

D. M.	D. W.	Meetings of Societies, &c.	Memoranda.
1	W	Edinburgh Soc., North Staffordshire	
2	Th	Bolton S., Dundee, Glasgow Assoc., Leeds	
3	F		
4	S		
5	S	Sexagesima Sunday	
6	M		
7	Tu	Shef., Sut., Pais., N. Lon., Hlmfth., Glos.	
8	W	[D., Cov., Car.	
9	Th	Birkenhd., Bradfd., Cheltenham, Man-	
10	F	Ireland [chester Society	
11	S		
12	S	Quinquagesima Sunday	
13	M		
14	Tu	Gt. Britain, Newc., Manch. Ama., Derby	
15	W	Bristol, Bury, Edin. C., Hyde, Manch. C.	
16	Th		
17	F		
18	S		
19	S	1st Sunday in Lent	
20	M		
21	Tu	Glasgow Amateur, North London	
22	W		
23	Th	Burton, Liverpool Ama., Oldham, Hull,	
24	F	[Halifax, York. Col.	
25	S		
26	S	2nd Sunday in Lent	
27	M		
28	Tu	Great Britain (Technical)	
29	W		

MARCH.

D. M.	D. W.	Remarkable Events.	Sun. Rises. H. M.	Sun. Sets. H. M.	Moon. Rises. Morn.	Moon. Sets. Morn.
1	Th		6 48	5 37	9 40	Morn
2	F		6 46	5 39	10 12	0 31
3	S		6 44	5 41	10 51	1 34
4	S	3rd Sun. in Lent. Poitevin d. 1882	6 42	5 42	11 37	2 36
5	M	La Place d. 1827. J. Albert b. 1825	6 40	5 44	After	3 34
6	Tu	Fraunhofer b. 1787 [☾ 3.26 M.	6 37	5 46	1 38	4 26
7	W	J. N. Niepce b. 1765. Herschel b.	6 35	5 48	2 52	5 11
8	Th	[1792	6 33	5 49	4 12	5 50
9	F		6 31	5 51	5 35	6 25
10	S	[Deville b. 1818	6 28	5 53	6 59	6 55
11	S	4th Sunday in Lent. St. Claire	6 26	5 55	8 21	7 24
12	M	● 4.21 A.	6 24	5 56	9 42	7 54
13	Tu		6 22	5 58	11 0	8 24
14	W	Herschel int. hypo for fixing, 1839	6 19	6 0	Morn	8 57
15	Th	F. A. Wenderoth d. 1884	6 17	6 2	0 13	9 34
16	F		6 15	6 3	1 20	10 17
17	S		6 13	6 5	2 19	11 5
18	S	5th Sunday in Lent	6 10	6 7	3 9	11 58
19	M	Thos. Sutton d. 1875	6 8	6 8	3 52	After
20	Tu	☽ 8.43 A.	6 6	6 10	4 28	1 57
21	W	Bingham d. 1870	6 4	6 12	4 59	2 59
22	Th		6 1	6 13	5 25	4 2
23	F		5 59	6 15	5 49	5 4
24	S	Becquerel b. 1820	5 57	6 17	6 11	6 7
25	S	Palm Sunday. Hermagis d. 1868	5 54	6 18	6 32	7 11
26	M		5 52	6 20	6 54	8 15
27	Tu	○ 10.7 A.	5 50	6 22	7 17	9 19
28	W	La Place b. 1749	5 47	6 23	7 43	10 23
29	Th		5 45	6 25	8 13	11 26
30	F	Balard d. 1876	5 43	6 27	8 49	Morn
31	S	Bunsen b. 1811	5 41	6 28	9 31	0 27

MARCH.

D. M.	D. W.	Meetings of Societies, &c.	Memoranda.
1	Th	Bolton Soc., Dundee, Glasgow A., Leeds	
2	F		
3	S		
4	S	3rd Sunday in Lent	
5	M		
6	Tu	Carl.,Glos.Dale,Hlmfth.,N.Lond., Sutton,	
7	W	Edin. Soc., N. Staff. [Paisley, Sheffield	
8	Th	B'head, Bradford, Cheltenham, Manches-	
9	F	Ireland [ter Soc.	
10	S		
11	S	4th Sunday in Lent	
12	M		
13	Tu	Gt. Britain, Newc., Manch. Am., Derby	
14	W		
15	Th		
16	F		
17	S		
18	S	5th Sunday in Lent	
19	M		
20	Tu	Glasgow Amateur, North London	
21	W	Bristol, Bury, Hyde, Manch. C., Edin. C.	
22	Th	Burton-on-Trent	
23	F		
24	S		
25	S	Palm Sunday	
26	M		
27	Tu	Great Britain (Technical)	
28	W		
29	Th	Liverpool Amateur, Oldham, Yorkshire	
30	F	[College, Halifax	
31	S		

APRIL.

D. M.	D. W.	Remarkable Events.	Sun Rises H. M.	Sun Sets H. M.	Moon Rises Morn.	Moon Sets Morn.
1	S	Easter Sunday. ['45. Morse d. '72.	5 38	6 30	10 21	1 25
2	M	First Sun Photo. by Tizeau & Foucalt,	5 36	6 32	11 20	2 18
3	Tu	☾ 0.41 A.	5 34	6 33	After	3 4
4	W		5 32	6 35	1 43	3 45
5	Th	Rev. J. B. Reade b. '01. Isidore Niepce	5 29	6 37	3 2	4 20
6	F	[b. 1795	5 27	6 38	4 25	4 51
7	S	Voightlander d. '78. Nièpce de St.	5 25	6 40	5 49	5 20
8	S	Low Sunday. [Victor d. 1870.	5 23	6 41	7 11	5 49
9	M	Fox Talbot's First Art. in *Athenæum*	5 20	6 43	8 33	6 19
10	Tu	Pouncy's Carbon Process pat. 1858	5 18	6 45	9 52	6 51
11	W	Nottage d. 1885 ● 9.8 M.	5 16	6 46	11 4	7 27
12	Th	T. R. Williams d. 1871	5 14	6 48	Morn	8 9
13	F		5 12	6 50	0 9	8 56
14	S		5 9	6 52	1 5	9 49
15	S	2nd Sunday after Easter	5 7	6 53	1 51	10 47
16	M		5 5	6 55	2 30	11 48
17	Tu	Fargier's Carbon Process pat. 1861	5 3	6 57	3 3	After
18	W		5 1	6 58	3 30	1 53
19	Th	Abbé Moigno b. 1804 ☽ 11.52 M.	4 59	7 0	3 54	2 56
20	F	J. A. Spencer d. 1878	4 57	7 2	4 17	3 59
21	S	Talbot's Photo.-etch. Process pat. '58	4 54	7 3	4 37	5 2
22	S	3rd Sunday after Easter. Rev.	4 52	7 5	4 59	6 6
23	M	[F. F. Statham d. 1884	4 50	7 6	5 22	7 10
24	Tu	Celsius d. 1744	4 48	7 8	5 47	8 15
25	W	'Sun-blinds' pat. 1862	4 46	7 10	6 15	9 20
26	Th	Adam Salomon d. 1881 ○ 6.22 M.	4 44	7 11	6 49	10 23
27	F	Morse b. 1791	4 42	7 13	7 28	11 22
28	S	Böttger b. 1806	4 40	7 15	8 15	Morn
29	S	4th S. af. Easter. Dixon's Iodide	4 38	7 16	9 11	0 16
30	M	[Emul. Pro. pat. '61. Böttger d. '81.	4 36	7 18	10 15	1 3

APRIL.

D. M.	D. W.	MEETINGS OF SOCIETIES, &c.	MEMORANDA.
1	S	Easter Sunday	
2	M		
3	Tu	N.Lond., Glossop Dale, Holmfirth, Sutton,	
4	W	Edin. Soc., N. Staff. [Paisley, Sheffield	
5	Th	Bolton S., Dundee, Glas. Amateur, Leeds	
6	F		
7	S		
8	S	Low Sunday	
9	M		
10	Tu	Gt. Britain, Newc., Manch. Am., Derby	
11	W		
12	Th	B'head, Bradford, Cheltenham, Manch.	
13	F	Ireland [Soc.	
14	S		
15	S	2nd Sunday after Easter	
16	M		
17	Tu	Glasgow Amateur, North London	
18	W	Bristol, Bury, Hyde, Manchester Club,	
19	Th	[Edinburgh Club	
20	F		
21	S		
22	S	3rd Sunday after Easter	
23	M		
24	Tu	Great Britain (Technical)	
25	W		
26	Th	Liverpool Amateur, Oldham, Yorks Col.,	
27	F	[Halifax, Burton-on-Trent	
28	S		
29	S	4th Sunday after Easter	
30	M		

MAY.

D. M.	D. W.	Remarkable Events.	SUN. Rises. H. M.	Sets. H. M.	MOON. Rises. Morn.	Sets. Morn.
1	Tu		4 35	7 20	11 26	1 44
2	W	☾ 11.47 A.	4 33	7 21	After	2 20
3	Th		4 31	7 23	2 0	2 51
4	F	Senebier b. 1742	4 29	7 24	3 20	3 20
5	S	J. W. Draper b. 1811	4 27	7 26	4 41	3 47
6	**S**	Rogation Sunday. Humboldt d. '59	4 25	7 28	6 3	4 15
7	M	Fortier d. 1882	4 24	7 29	7 23	4 45
8	Tu	Peroxide of H. rec. for rem. of Hypo, '66	4 22	7 31	8 40	5 19
9	W	Guy Lussac d. 1850	4 20	7 32	9 51	5 58
10	Th	South London Photo. Soc. f. 1859	4 18	7 34	10 54	6 43
11	F	H. Baden Pritchard d. 1884 ● 1.23 M.	4 17	7 36	11 46	7 35
12	S	Sir John Herschel d. 1871	4 15	7 37	Morn	8 33
13	**S**	Sun. after Ascension. Justus von	4 14	7 39	0 29	9 34
14	M	Fahrenheit b. 1686 [Liebig b. 1803	4 12	7 40	1 5	10 37
15	Tu		4 11	7 42	1 34	11 41
16	W	C. Breese d. 1875. C. Russell d. 1887	4 9	7 43	2 0	After
17	Th	Belgian Photo. Association f. 1874	4 8	7 45	2 22	1 48
18	F	☽ 11.5 A.	4 6	7 46	2 44	2 51
19	S		4 5	7 47	3 5	3 54
20	**S**	Whit Sunday.—Pentecost	4 4	7 49	3 27	4 58
21	M	Scheele d. 1786	4 2	7 50	3 50	6 4
22	Tu		4 1	7 52	4 17	7 10
23	W	J. W. Gough d. 1878	4 0	7 53	4 49	8 15
24	Th		3 59	7 54	5 26	9 17
25	F	T. J. Pearsall d. 1883 ○ 1.40 M.	3 58	7 56	6 11	10 14
26	S		3 56	7 57	7 5	11 4
27	**S**	Trinity Sunday	3 55	7 58	8 7	11 47
28	M		3 54	7 59	9 16	Morn
29	Tu	Sir H. Davy d. 1829	3 53	8 1	10 29	0 24
30	W	J. Sidebotham d. 1885	3 52	8 2	11 45	2 56
31	Th		3 52	8 3	After	1 24

MAY.

D. M.	D. W.	Meetings of Societies, &c.	Memoranda.
1	Tu	N.Lond., Glos.D., Holmfirth, Sutton, Shef.	
2	W	Edinburgh Society, North Staffordshire	
3	Th	Bolton Society, Dundee, Leeds	
4	F		
5	S		
6	S	Rogation Sunday	
7	M		
8	Tu	Gt. Britain, Newc., Manch. Am., Derby	
9	W		
10	Th	Birkenhead, Bradford, Cheltenham, Man-	
11	F	Ireland [chester Society	
12	S		
13	S	Sunday after Ascension	
14	M		
15	Tu	North London, Glasgow Amateur	
16	W	Bristol, Bury, Hyde, Manch. C., Edin. C.	
17	Th		
18	F		
19	S		
20	S	Whit Sunday.—Pentecost	
21	M		
22	Tu	Gt. Britain (Technical)]	
23	W		
24	Th		
25	F		
26	S		
27	S	Trinity Sunday	
28	M		
29	Tu		
30	W		
31	Th	York.Col., Halifax, Liverpool Am., Oldham	

JUNE.

D. M.	D. W.	Remarkable Events.	SUN. Rises. H. M.	SUN. Sets. H. M.	MOON. Rises. After.	MOON. Sets. Morn.
1	F	Imp. in Calotype pat. (0.53 A.	3 51	8 4	2 20	1 50
2	S	Niepce pubsh. his *Heliochromic Pro-*	3 50	8 5	3 41	2 16
3	S	1st Sun. after Trinity. [*cesses*, '51	3 49	8 6	5 0	2 44
4	M	Tessié du Mothay d. 1880	3 49	8 7	6 17	3 15
5	Tu		3 48	8 8	7 30	3 51
6	W	Fordos d. 1878	3 47	8 9	8 38	4 32
7	Th	Fraunhofer d. 1826	3 47	8 10	9 36	5 20
8	F		3 46	8 11	10 24	6 16
9	S	Constant Delessert d. 1876 ● 4.34 A.	3 46	8 12	11 4	7 17
10	S	2nd Sunday after Trinity	3 45	8 13	11 36	8 21
11	M	Cutting's American Bromide pat. '53	3 45	8 13	Morn	9 26
12	Tu		3 45	8 14	0 3	10 30
13	W	[Niepce, 1837	3 45	8 15	0 27	11 34
14	Th	Partnership between Daguerre and	3 44	8 15	0 49	After
15	F	[com. to Roy. Soc.	3 44	8 16	1 10	1 42
16	S	Chrysotype and Cyanotype Processes	3 44	8 16	1 32	2 46
17	S	3rd Sunday after Trinity.) 6.50 M.	3 44	8 17	1 54	3 50
18	M	O. G. Rejlander d. 1875	3 44	8 17	2 19	4 55
19	Tu	Abbe Laborde d. 1883	3 44	8 18	2 49	6 1
20	W		3 44	8 18	3 23	7 6
21	Th	Niepce Memorial uncovered at Cha-	3 44	8 18	4 5	8 6
22	F	[lons, 1885. Dr. Diamond d.	3 45	8 19	4 56	9 1
23	S	○ 9.8 A.	3 45	8 19	5 56	9 48
24	S	4th Sunday after Trinity	3 45	8 19	7 4	10 27
25	M	[b. 1839	3 45	8 19	8 17	11 1
26	Tu	W. B. Woodbury b. 1834. Liesegang	3 46	8 19	9 33	11 30
27	W	Herr Wothly d. '73. G. Price d. '70	3 46	8 19	10 51	11 56
28	Th		3 47	8 19	After	Morn
29	F	Ferrous-oxalate Develop. pub. 1877	3 47	8 19	1 26	0 22
30	S	Frank Howard d. 1866	3 48	8 18	2 43	0 49

JUNE.

D. M.	D. W.	Meetings of Societies, &c.	Memoranda.
1	F		
2	S		
3	S	1st Sunday after Trinity	
4	M		
5	Tu	N. Lond., Glos. D., Holmfirth, Sutton, Shef.	
6	W	Edinburgh Society, North Staffordshire	
7	Th	Leeds	
8	F		
9	S		
10	S	2nd Sunday after Trinity	
11	M		
12	Tu	Great Britain, Manchester Amateur, Derby	
13	W		
14	Th	Birkenhead, Bradford	
15	F		
16	S		
17	S	3rd Sunday after Trinity	
18	M		
19	Tu	North London	
20	W	Bristol, Bury, Manch. C., Edin. C.	
21	Th		
22	F		
23	S		
24	S	4th Sunday after Trinity	
25	M		
26	Tu	Great Britain (Technical)	
27	W		
28	Th	Liverpool Amateur, Oldham, York. Col., [Halifax	
29	F		
30	S		

JULY.

D. M.	D. W.	Remarkable Events.		Sun Rises. H. M.	Sun Sets. H. M.	Moon Rises. After.	Moon Sets. Morn.
1	S	5th Sunday after Trinity	☾ 3.53 M.	3 49	8 18	4 0	1 17
2	M			3 49	8 18	5 14	1 49
3	Tu			3 50	8 18	6 23	2 27
4	W	Philip Remele d. 1883		3 51	8 17	7 24	3 11
5	Th	J. Nicephore Niepce d. 1833		3 51	8 17	8 17	4 3
6	F	Rev. W. J. Whiting d. 1885		3 52	8 16	9 0	5 1
7	S	Dr. Schnauss b. 1827		3 53	8 16	9 36	6 4
8	S	6th Sunday after Trinity		3 54	8 15	10 6	7 9
9	M		● 6.17 M.	3 55	8 14	10 31	8 15
10	Tu	Daguerre d. 1851		3 56	8 14	10 52	9 21
11	W			3 57	8 13	11 15	10 24
12	Th	Wedgwood b. 1730		3 58	8 12	11 35	12 27
13	F	Abbé Moigno d. 1884		3 59	8 11	11 57	After
14	S	Dumas b. 1800		4 0	8 10	Morn	1 35
15	S	7th Sunday after Trinity		4 2	8 9	0 21	2 41
16	M	Claudet b. 1797	☽ 0.13 A.	4 3	8 8	0 49	3 45
17	Tu			4 4	8 7	1 20	4 50
18	W	V. M. Griswold (Inv. Ferrotype) d.'72		4 5	8 6	1 58	5 53
19	Th			4 6	8 5	2 44	6 50
20	F	Collodion Pos. Process pub. 1852		4 8	8 4	3 41	7 41
21	S	Regnault b. 1810		4 9	8 3	4 48	8 24
22	S	8th Sun. af. Trin. Bessel b. 1784		4 10	8 2	6 1	9 1
23	M		○ 5.45 M.	4 12	8 1	7 18	9 33
24	Tu	Captain Abney b. 1843		4 13	7 59	8 37	10 1
25	W			4 15	7 58	9 56	10 28
26	Th	Nièpce de St. Victor b. 1806		4 16	7 57	11 15	10 54
27	F			4 17	7 55	After	11 22
28	S			4 19	7 54	1 49	11 52
29	S	9th Sun. af. Trin. Secchi b. 1818		4 20	7 52	3 2	Morn
30	M		☾ 8.30 A.	4 22	7 51	4 11	0 27
31	Tu	Wohler b. 1800		4 23	7 49	5 15	1 8

JULY.

D. M.	D. W.	Meetings of Societies, &c.	Memoranda.
1	S	5th Sunday after Trinity	
2	M	Notts	
3	Tu	N. London, Glos. Dale, Holmfirth, Sutton	
4	W	North Staffordshire	
5	Th		
6	F		
7	S		
8	S	6th Sunday after Trinity	
9	M		
10	Tu	Manchester Amateur, Derby	
11	W		
12	Th	Birkenhead, Bradford	
13	F		
14	S		
15	S	7th Sunday after Trinity	
16	M		
17	Tu	North London	
18	W	Bristol, Bury, Manchester Club	
19	Th		
20	F		
21	S		
22	S	8th Sunday after Trinity	
23	M		
24	Tu	Great Britain (Technical)	
25	W		
26	Th	Liverpool Amateur, Oldham	
27	F		
28	S		
29	S	9th Sunday after Trinity	
30	M		
31	Tu		

AUGUST.

D. M.	D. W.	REMARKABLE EVENTS.	SUN. Rises. H. M.	SUN. Sets. H. M.	MOON. Rises. After.	MOON. Sets. Morn.
1	W		4 25	7 48	6 10	1 56
2	Th	Stromeyer b. 1776	4 26	7 46	6 55	2 51
3	F	Mungo Ponton d. 1880	4 28	7 44	7 34	3 51
4	S		4 29	7 43	8 7	4 55
5	S	10th S. af. Trin. Wollaston b. 1766	4 31	7 41	8 34	6 0
6	M	Rose b. 1795	4 32	7 39	8 56	7 6
7	Tu	Berzelius d. 1848 ● 6.21 A.	4 34	7 37	9 19	8 10
8	W	Roger Fenton d. 1869	4 35	7 36	9 40	9 14
9	Th		4 37	7 34	10 1	10 18
10	F	Jabez Hughes d. 1884	4 38	7 32	10 24	11 22
11	S	E. A. Hadow d. 1866	4 40	7 30	10 49	After
12	S	11th S. af. Trin. J.H. Fitzgibbon d.	4 42	7 28	11 18	1 28
13	M	Prof. Stokes b. 1819 [1882	4 43	7 26	11 52	2 33
14	Tu	Daguerreotype Proc. pat. '39 ☽ 4.44 A.	4 45	7 24	Morn	3 36
15	W		4 46	7 22	0 34	4 35
16	Th	Lavoisier b. 1743	4 48	7 20	1 25	5 29
17	F		4 49	7 18	2 27	6 16
18	S	Dr. Woodward (photo-microscopist) d.	4 51	7 16	3 37	6 56
19	S	12th Sunday after Trinity [1884	4 53	7 14	4 54	7 31
20	M	Prof. Tyndall b. 1820	4 54	7 12	6 14	8 2
21	Tu	Chevreul b. 1786 ○ 4.20 A.	4 56	7 10	7 36	8 30
22	W	Sir Frederick Pollock d. 1870	4 57	7 8	8 58	8 57
23	Th		4 59	7 7	10 18	9 25
24	F	Cutting (Introd. of Ambrotype) d. '67	5 1	7 4	11 37	9 55
25	S	Faraday d. 1867.	5 2	7 2	After	10 29
26	S	13th S. af. Trin. Paul Pretsch d. '73.	5 4	7 0	2 4	11 8
27	M	[Daguerre Memorial uncovered, '83	5 5	6 58	3 9	11 54
28	Tu		5 7	6 55	4 6	Morn
29	W	Varrentrapp b. 1815 ☾ 2.18 A.	5 9	6 53	4 55	0 46
30	Th	Oliver Sarony d. 1879	5 10	6 51	5 35	1 44
31	F	Helmholtz b. 1821	5 12	6 48	6 8	2 45

AUGUST.

D. M.	D. W.	MEETINGS OF SOCIETIES, &c.	MEMORANDA.
1	W	North Staffordshire	
2	Th		
3	F		
4	S		
5	S	10th Sunday after Trinity	
6	M	Notts	
7	Tu	N. London, Glos. Dale, Holmfirth, Sutton	
8	W		
9	Th	Birkenhead, Bradford	
10	F		
11	S		
12	S	11th Sunday after Trinity	
13	M		
14	Tu	Manchester Amateur, Derby	
15	W	Bristol, Bury, Manchester Club	
16	Th		
17	F		
18	S		
19	S	12th Sunday after Trinity	
20	M		
21	Tu	North London	
22	W		
23	Th	Liverpool Amateur, Oldham	
24	F		
25	S		
26	S	13th Sunday after Trinity	
27	M		
28	Tu	Great Britain (Technical)	
29	W		
30	Th		
31	F		

SEPTEMBER.

D. M.	D. W.	Remarkable Events.	Sun. Rises. H. M.	Sun. Sets. H. M.	Moon. Rises. After.	Moon. Sets. Morn.
1	S	Norris's Dry-plate Process pat. 1856	5 13	6 47	6 37	3 49
2	S	14th S. af. Trin. W. Blair drownd. '71	5 15	6 45	7 2	4 55
3	M		5 17	6 42	7 24	6 0
4	Tu	Woodbury d. 1885	5 18	6 40	7 44	7 3
5	W	Pantascope Camera pat. 1862	5 20	6 38	8 5	8 7
6	Th	● 4.56 M.	5 21	6 36	8 27	9 11
7	F	Poitevin Memorial inaugurated, 1885	5 23	6 33	8 50	10 14
8	S	First Exp. in Gelatino-bromide p. '71	5 24	6 31	9 17	11 17
9	S	15th S. af. Trin. Collodio-bromide	5 26	6 29	9 49	After
10	M	[Process pub. 1864	5 28	6 26	10 27	1 23
11	Tu		5 29	6 24	11 12	2 22
12	W	☽ 10.0 A.	5 31	6 22	Morn	3 17
13	Th		5 33	6 20	0 7	4 6
14	F	Humboldt b. 1769	5 34	6 17	1 12	4 48
15	S	[1878. Prof. Graham d. 1869	5 36	6 15	2 26	5 25
16	S	16th S. af. Trin. J. L. Gihon d.	5 37	6 13	3 45	5 58
17	M	Fox Talbot d. 1877	5 39	6 10	5 7	6 28
18	Tu	Leon Foucalt b. 1819	5 40	6 8	6 30	6 56
19	W	T. Grubb d. 1878	5 42	6 6	7 54	7 24
20	Th	Talbot's Disc. of Develop. '40. F. A.	5 44	6 3	9 17	7 54
21	F	Stas b. 1813 [Wilde d. '83 ○ 5.24 M.	5 45	6 1	10 37	8 27
22	S	Faraday b. 1791. Thos. Sutton b. '19	5 47	5 59	11 52	9 5
23	S	17th S. af. Trin. Woodbury Pro. p. '64	5 49	5 56	After	9 50
24	M	J. G. Tunny d. 1887	5 50	5 54	2 3	10 40
25	Tu	Dr. Van Monckhoven b. 1834, d. '82	5 52	5 52	2 54	11 37
26	W		5 53	5 50	3 36	Morn
27	Th	Kolbe b. 1818	5 55	5 47	4 11	0 38
28	F	H. Negretti d. 1879 ☾ 8.30 M.	5 57	5 45	4 41	1 41
29	S	Courtois (Discoverer of Iodine) d. '38	5 58	5 43	5 7	2 46
30	S	18th Sun. after Trinity. Balard	6 0	5 40	5 29	3 50
		[(Discoverer of Bromine) b. 1802				

SEPTEMBER.

D. M.	D. W.	Meetings of Societies, &c.	Memoranda.
1	S		
2	S	14th Sunday after Trinity	
3	M		
4	Tu	N. London, Glos. Dale, Holmfirth, Sutton	
5	W	North Staffordshire	
6	Th	Bolton	
7	F		
8	S		
9	S	15th Sunday after Trinity	
10	M		
11	Tu	Manchester Amateur, Derby	
12	W		
13	Th	Birkenhead	
14	F		
15	S		
16	S	16th Sunday after Trinity	
17	M		
18	Tu	North London	
19	W	Bristol, Bury, Hyde, Manchester Club	
20	Th		
21	F		
22	S		
23	S	17th Sunday after Trinity	
24	M		
25	Tu	Great Britain (Technical)	
26	W		
27	Th	Liverpool Amateur, Oldham	
28	F		
29	S		
30	S	18th Sunday after Trinity	

OCTOBER.

D. M.	D. W.	Remarkable Events.	Sun. Rises. H. M.	Sun. Sets. H. M.	Moon. Rises. After.	Moon. Sets. Morn.
1	M		6 2	5 38	5 50	4 55
2	Tu	Arago d. 1853	6 3	5 36	6 11	5 59
3	W		6 5	5 34	6 32	7 2
4	Th		6 7	5 31	6 54	8 5
5	F	● 2.34 A.	6 8	5 29	7 20	9 9
6	S		6 10	5 27	7 49	10 12
7	S	19th Sunday after Trinity	6 12	5 25	8 23	11 14
8	M	Fr. Bollman d. 1863	6 13	5 22	9 6	After
9	Tu		6 15	5 20	9 56	1 10
10	W		6 17	5 18	10 55	2 0
11	Th	H. T. Anthony d. 1884	6 18	5 16	Morn	2 43
12	F	Gmelin b. 1792 ☽ 5.29 M.	6 20	5 13	0 2	3 21
13	S		6 22	5 11	1 16	3 55
14	S	20th Sunday after Trinity	6 23	5 9	2 35	4 25
15	M	Kaulback b. 1805	6 25	5 7	3 57	4 53
16	Tu		6 27	5 5	5 21	5 21
17	W	Reaumur d. 1757. Robert Hunt d. '87	6 29	5 3	6 46	5 50
18	Th	Schonbein b. 1799. Wheatstone d. '75	6 30	5 0	8 10	6 21
19	F	○ 9.9 A.	6 32	4 58	9 31	6 58
20	S		6 34	4 56	10 46	7 41
21	S	21st Sunday after Trinity	6 35	4 54	11 54	8 31
22	M		6 37	4 52	After	9 27
23	Tu		6 39	4 50	1 37	10 28
24	W		6 41	4 48	2 15	11 32
25	Th		6 43	4 46	2 46	Morn
26	F		6 44	4 44	3 12	0 37
27	S	[of Silver pub. 1864 ☾ 1.56 M.	6 46	4 42	3 36	1 42
28	S	22nd S. af. Trin. Collodio-chloride	6 48	4 40	3 57	2 46
29	M	Talbot Photo-engraving Proc. pat. '52	6 50	4 38	4 17	3 50
30	Tu		6 51	4 36	4 38	4 54
31	W	John Glover d. 1864	6 53	4 35	4 57	5 57

OCTOBER.

D. M.	D. W.	Meetings of Societies, &c.	Memoranda.
1	M	[Holmfirth, Cov·	
2	Tu	Carl.,Glos.D.,N.Lond.,Shef.,Sutt.,Paisly.,	
3	W	Edinburgh Society, North Staffordshire	
4	Th	Bolton, Dundee, Glasgow Assoc., Leeds	
5	F		
6	S		
7	S	19th Sunday after Trinity	
8	M		
9	Tu	Newcastle, Manchester Amateur, Derby	
10	W		
11	Th	Birkenhead, Bradford, Manch. Soc.	
12	F	Ireland	
13	S		
14	S	20th Sunday after Trinity	
15	M		
16	Tu	Glasgow Amateur, North London	
17	W	Bristol, Bury, Edin. C., Hyde, Manch. C.	
18	Th		
19	F		
20	S		
21	S	21st Sunday after Trinity	
22	M		
23	Tu	Great Britain (Technical)	
24	W	Burnley	
25	Th	Burton, Liverpool Amateur, Oldham,	
26	F	[Yorkshire College, Halifax	
27	S		
28	S	22nd Sunday after Trinity	
29	M		
30	Tu		
31	W		

NOVEMBER.

D. M.	D. W.	Remarkable Events.	SUN. Rises. H. M.	SUN. Sets. H. M.	MOON. Rises. After.	MOON. Sets. Morn.
1	Th		6 55	4 33	5 23	7 1
2	F	W. H. Rulofson d. 1878	6 57	4 31	5 51	8 5
3	S		6 58	4 29	6 24	9 8
4	S	23rd S. af. Trin. Mohr b. '06 ● 0.2 M.	7 0	4 27	7 3	10 9
5	M		7 2	4 25	7 49	11 6
6	Tu	Senefelder b. 1771	7 4	4 24	8 45	11 58
7	W	Dubois Raymond b. 1818	7 6	4 22	9 48	After
8	Th	F. Zollner b. 1834	7 7	4 20	10 57	1 22
9	F	Pretsch's Photo-engraving Proc. p. '54	7 9	4 19	Morn	1 55
10	S	Silvester Laroche d. 1886 ☽ 4.16 A.	7 11	4 17	0 13	2 25
11	S	24th S. af. Trin. Willis's Aniline	7 13	4 16	1 30	2 52
12	M	[Process pat. 1864	7 14	4 14	2 50	3 19
13	Tu		7 16	4 13	4 12	3 46
14	W		7 18	4 11	5 36	4 15
15	Th		7 20	4 10	7 0	4 49
16	F	Lavater d. 1741	7 21	4 8	8 19	5 29
17	S	C. B. Vignoles d. 1875	7 23	4 7	9 34	6 16
18	S	25th S. af. Trin. Daguerre b. 1787	7 25	4 6	10 39	7 11
19	M	Thorwalsden b. 1770 [○ 3.16 A.	7 27	4 5	11 32	8 13
20	Tu	Prof. Draper d. 1882	7 28	4 3	After	9 18
21	W		7 30	4 2	0 49	10 24
22	Th	Schlippe b. 1749	7 32	4 1	1 17	11 30
23	F	Harrison (Inv. of the Globe Lens) d. '64	7 33	4 0	1 41	Morn
24	S	Prof. Silliman d. 1864	7 35	3 59	2 3	0 35
25	S	26th S. af. Trin. J. B. Hockin d. '69.	7 36	3 58	2 23	1 40
26	M	☾ 5.21 A. [Gustav Re b. '35	7 38	3 57	2 44	2 43
27	Tu	Celsius b. 1701	7 40	3 56	3 5	3 46
28	W	Sutton's Panoramic Camera pat. '59	7 41	3 55	3 27	4 51
29	Th	Window d. 1875	7 42	3 54	3 53	5 56
30	F		7 44	3 53	4 24	7 0

NOVEMBER.

D. M.	D. W.	Meetings of Societies, &c.	Memoranda.
1	Th	Bolton, Dundee, Glasgow Am., Leeds	
2	F		
3	S		
4	S	23rd Sunday after Trinity	
5	M		
6	Tu	Carl.,Glos.D.,N.Lond.,Shef.,Sutt.,Paisly.,	
7	W	Edin. Soc., N. Staff. [Holmfirth, Cov.	
8	Th	Bradford, Birkenhead, Manchester Soc.	
9	F	Ireland	
10	S		
11	S	24th Sunday after Trinity	
12	M		
13	Tu	Newc., Manch. Am., Gt. Britain, Derby	
14	W		
15	Th		
16	F		
17	S		
18	S	25th Sunday after Trinity	
19	M		
20	Tu	North London, Glasgow Amateur	
21	W	Manch. C., Hyde, Bristol, Bury, Edin. C.	
22	Th	Burton	
23	F		
24	S		
25	S	26th Sunday after Trinity	
26	M		
27	Tu	Great Britain (Technical)	
28	W		
29	Th	York.Col.,Halifax,Liverpool Am.,Oldham	
30	F		

DECEMBER.

D. M.	D. W.	Remarkable Events.	Sun Rises. H. M.	Sun Sets. H. M.	Moon Rises. After.	Moon Sets. Morn.
1	S	Klaproth b. 1743	7 45	3 53	5 1	8 1
2	S	1st Sunday in Advent	7 47	3 52	5 45	9 2
3	M	● 10.6 M.	7 48	3 52	6 38	9 58
4	Tu	Galvani d. 1798	7 50	3 51	7 39	10 45
5	W		7 51	3 51	8 45	11 25
6	Th	Obernetter's Chromo-photography p.	7 52	3 50	9 58	After
7	F	[1864. Guy Lussac b. 1778	7 53	3 50	11 14	0 29
8	S	Will (Chemist) b. 1812	7 55	3 49	Morn	0 56
9	S	2nd S. in Ad. Scheele b. 1742. Duc de	7 56	3 49	0 31	1 22
10	M	☽ 6.46 M. [Luynes d. '67. Grasshof d. '71	7 57	3 49	1 50	1 47
11	Tu	Sir D. Brewster b. 1781	7 58	3 49	3 10	2 14
12	W	Reade d. 1870	7 59	3 49	4 31	2 44
13	Th	First Photo-enamel Process pat. '54	8 0	3 49	5 51	3 20
14	F	Barreswil b. 1817.	8 1	3 49	7 9	4 2
15	S	[T. Ross d. 1870	8 2	3 49	8 19	4 52
16	S	3rd S. in Ad. H. Greenwood d. '84.	8 3	3 49	9 19	6 52
17	M	Sir Humphry Davy b. 1778	8 3	3 49	10 9	6 57
18	Tu	○ 10.41 M.	8 4	3 49	10 48	8 5
19	W	Mawson k. 1867	8 5	3 50	11 19	9 13
20	Th	Pyrogallic Acid intro. as a Developer	8 5	3 50	11 45	10 20
21	F	[by Archer, 1851	8 6	3 51	After	11 25
22	S	Wollaston d. 1828	8 7	3 51	0 30	Morn
23	S	4th Sunday in Advent	8 7	3 52	0 49	0 30
24	M		8 7	3 52	1 9	1 34
25	Tu	Christmas Day. Sir I. Newton b. 1642	8 8	3 53	1 31	2 38
26	W	☾ 6.0 M.	8 8	3 53	1 56	3 43
27	Th	A. Claudet d. 1867	8 8	3 54	2 24	4 46
28	F	J. T. Goddard d. 1866	8 8	3 55	2 58	5 50
29	S		8 9	3 56	3 40	6 53
30	S	S. af. Chris. J. H. Dallmeyer d. '83	8 9	3 57	4 30	7 51
31	M	A. Braun d. 1877. C. Waldack d. 1882	8 9	3 58	5 30	8 41

DECEMBER.

D. M.	D. W.	MEETINGS OF SOCIETIES, &c.	MEMORANDA.
1	S		
2	S	1st Sunday in Advent	
3	M		
4	Tu	Carl., Glos. D., N. Lond., Shef., Sutt. Paisly.,	
5	W	Edin. Soc., N. Staff. [Holmfirth, Cov.	
6	Th	Leeds, Glasgow Assoc., Dundee, Bolton	
7	F		
8	S		
9	S	2nd Sunday in Advent	
10	M		
11	Tu	Newc., Manch. Am., Gt. Britain, Derby	
12	W		
13	Th	Bradford, Birkenhead, Manchester Soc.	
14	F	Ireland	
15	S		
16	S	3rd Sunday in Advent	
17	M		
18	Tu	North London, Glasgow Amateur	
19	W	Manch. C., Hyde, Bristol, Bury, Edin. C.	
20	Th		
21	F		
22	S		
23	S	4th Sunday in Advent	
24	M		
25	Tu	Christmas Day	
26	W		
27	Th	Oldham, Burton, Halifax, Yorkshire Col.	
28	F		
29	S		
30	S	Sunday after Christmas	
31	M		

PHOTOGRAPHIC SOCIETIES, &c.

Aberdeen and North of Scotland Amateur Photographic Association.

ESTABLISHED 1885.

The Annual Meeting is held in April. During the winter, Meetings are held monthly, on Saturdays, at Eight p.m., in the Café Shiprow. In summer, excursions take place monthly.

President—John Milne.
Vice-President—Robert Houston.
Council—T. W. Binner, G. M. Watson, Alex. McKilligan.
Treasurer—Alexander Edward, jun.
Secretary—James Main, 20 Netherkirkgate, Aberdeen.

Amateur Photographic Association.

ESTABLISHED 1861.

President—His Royal Highness the Prince of Wales.

Vice-Presidents—His Grace the Archbishop of York, The Most Noble the Marquis of Drogheda, Lieut.-General the Right Hon. the Lord de Ros, The Right Hon. the Earl of Rosse, F.R.S.

Council—Arthur Farre, Esq., M.A., M.D., F.R.S., James Glaisher, Esq., F.R.S., F.R.A.S., &c. (*Referee*), Captain J. C. A. Lewis, M.A. (*Cantab.*), Charles Stephens, Esq., M.A. (*Oxon.*), W. D. Howard, Esq., F.I.C. (*Referee*), Walter Wood, Esq., F.R.H.S., W. S. Hobson, Esq.

Hon. Secretary—Mr. Arthur James Melhuish, F.R.A.S., and F.R. Met. Soc.
Executive Artist—Mr. Alexander Bassano.
Offices—25 Old Bond Street, London, W.

Amateur Photographic Field Club.

ESTABLISHED 1852.

Monthly Outings during the summer. Indoor Meetings monthly during the winter.

President—T. M. Brownrigg.
Secretary—W. Wainwright, jun., Hoe Place, Woking.

Birkenhead Photographic Association.

ESTABLISHED 1884.

Meet second Thursday in each month at the Free Public Library, at half-past Seven p.m. Annual Meeting in October.

President—John H. Day.

Vice-President—Paul Lange.

Council—A. W. Beer, B. J. Sayce, G. A. Kenyon, M.D., J. A. Forrest, H. H. Williams, W. P. Riley, R. W. Hill, H. Lupton, P. H. Phillips, T. C. James.

Treasurer—E. Whalley.

Secretary—George A. Carruthers, Woodhey, Rock Ferry.

Birmingham Photographic Society.

ESTABLISHED 1885.

Annual Meeting, November 24. May, June, July, August, and September, Meetings monthly. October, November, December, January, February, March, April, Meetings fortnightly.

President—R. H. Norris, M.D.

Vice-Presidents—J. C. Huxley, M.D., and W. J. Harrison, F.G.S.

Council—F. Birkett, S. Delicate, J. P. Heaton, S. J. Holliday, E. H. Jaques W. J. Barwell, W. B. Osborn, F. G. H. Young.

Librarian—E. C. Middleton.

Treasurer—G. M. Iliff.

Secretaries—J. H. Pickard, 361 Moseley Road, Birmingham, and William Rooke, Ascots Road, Moseley.

Blackburn Literary Club (Photographic Section).

ESTABLISHED 1884.

Each Section of the Club is managed by its own Secretary. Meetings and Excursions at intervals during the season.

President—T. J. Syckelmoore, B.A.

Vice-President—Charles Smithies.

Hon. Secretary—E. S Johnson, Literary Club, Blackburn.

Bolton Photographic Club.

ESTABLISHED 1883.

Meetings are held every Tuesday Evening, at the Studio of the Club, Chancery Lane, Bolton, at Eight o'clock p.m.

President—Jabez Boothroyd.
Vice-President—Thomas Jukes.
Committee—Messrs. Hawksworth, Banks, Bradshaw, Ashworth, Sewell.
Treasurer—John Bradshaw.
Secretary—James Slater, Town Hall Square, Bolton.

Bolton Photographic Society.

ESTABLISHED 1879.

Ordinary Meetings held at the Baths, Bridgman Street, on the first Thursday in each month from September to May, at Eight p.m. Annual Meeting, first Thursday in October.

President—J. R. Bridson.
Vice-Presidents—R. Harwood, E. N. Ashworth, T. Parkinson, J. W. Hawksworth, J. W. Cundey, M.A., W. Knowles.
Council—J. Boothroyd, J. Leach, R. Mercer, J. Lomax, Thomas Davis, W. Laithwate
Hon. Treasurer—C. K. Dalton.
Hon. Secretary—B. H. Abbatt, 12 Corporation Street, Bolton.

Bradford Amateur Photographic Society.

ESTABLISHED 1882.

Meetings are held at Bridges & Smith's Studio, Bradford; time, half-past Seven, second Thursday in the month.

President—Duncan G. Law.
Vice-President—H. Forsyth.
Committee—J. Sonnenthal, W. H. Scott, H. Forsyth, G. D. Scorah, M. B Wallace, J. Cotton, J. E. Fawcett, W. S. Smith.
Treasurer—W. S. Smith.
Secretary—G. D. Scorah, 11 Leeds Road, Bradford.

Bristol Camera Society.

ESTABLISHED 1887.

The Meetings of the Society are held at the University College, Tyndall's Park, on the second and fourth Thursdays in each month, commencing at half-past Seven p.m. Annual Meeting, first Thursday in October.

President—Abel Lewis.

Vice-Presidents—Arthur Richardson, Ph.D., and Graham Young.

Council—W. M. Appleton, C. Bryant, M. W. Dunscombe, J. S. Griffiths E. Harris, H. Senington.

Treasurer—Henry F. Lewis, 124 Hampton Road, Clifton.

Hon. Secretary—F. Holmes.

British Association for the Advancement of Science,

22 ALBEMARLE STREET, LONDON, W.

ESTABLISHED 1831.

The next Annual Meeting will be held at Bath.

President—Sir H. E. Roscoe, M.P., F.R.S.

General Treasurer—Professor A. W. Williamson, F.R.S.

General Secretaries—Captain Douglas Galton, C.B., F.R.S., and A. G. Vernon Harcourt, F.R.S.

Secretary—A. T. Atchison, M.A.

Bury Photographic and Arts Club.

ESTABLISHED 1882.

Ordinary Meetings held every third Wednesday in each month. Annual Meeting, third Wednesday in October, at half-past Seven.

President—F. Cooper.

Vice-Presidents—W. S. Barlow and E. W. Mellor.

Council—H. M. Dearden, C. H. Openshaw, R. Grundy, jun., A. Taylor, W. Booth.

Auditors—J. Newbold and R. Wood.

Hon. Secretary—F. W. Livsey.

Assistant Hon. Secretary and Treasurer—R. Grundy, sen.

Bristol and West of England Amateur Photographic Association.

RE-ESTABLISHED 1876.

Meetings at half-past Seven p.m., third Wednesday in each month, at Queen's Hotel, Clifton, Bristol.

President—Thomas Davey.

Vice-Presidents—Colonel Playfair and H. A. Hood Daniel, F.S.I.

Council—The Officers and W. W. Boyden, J. Phillips, W. B. Wright.

Treasurer and Secretary—E. Brightman, Lyndale, Redland Road, Bristol.

Burnley and District Amateur Photographic Society.

ESTABLISHED 1885.

Meetings, third Wednesday in each month except May, June, July, August, and September, at Eight o'clock, Mechanics' Institution.

President—John Butterworth.

Vice-President—D. Drew.

Committee—John Butterworth, D. Drew, J. Pickles, J. W. Houlden, J. Holgate, W. Sutcliffe.

Treasurer and Secretary—William Sutcliffe, 7 Bank Hall Terrace, Burnley.

Burton-on-Trent Amateur Photographic Association.

ESTABLISHED 1883.

Meetings, at the Institute, Union Street, fourth Thursday in each month.

President—Rev. J. Bramell.

Committee—T. Gill, T. Gretton, J. Stirk.

Treasurer—A. R. Siddels.

Hon. Secretary—S. Sims, 56 Branstone Road, Burton-on-Trent.

Cambridge University Photographic Society.

ESTABLISHED 1882.

Fortnightly Meetings in Members' Rooms. Dark rooms, 26 Park Street, Cambridge.

President—W. N. Shaw, M.A. (Emmanuel).

Vice-President—Rev. A. T. Chapman (Emmanuel).

Committee—R. M. Meyer (Trinity), A. H. Colman (Trinity), B. W. Crump (Jesus), W. J. Armitage (Emmanuel).

Secretary and Treasurer—V. G. Middleton (Trinity), Trinity College, Cambridge.

Camera Club.

ESTABLISHED 1885.

21 Bedford Street, Covent Garden, W.C. A social, scientific, and artistic centre for Amateur Photographers. Meetings for discussion every Thursday evening at Eight p.m. from October to April. Musical Meetings the first Monday in each month at Eight p.m. Summer Meetings for outdoor photography from April to September. Special Annual Meeting and Conference in February. Journal of Club proceedings published monthly. Dark room.

President—Captain W. de W. Abney, R.E., F.R.S.

Committee—Frederic Machell Smith (*Chairman*), William Adcock, William K. Burton, John Beverley Campbell, Lyonel Clark, Francis Cobb, John France Collins, Arthur Robert Dresser, John Duncuft, P. H. Emerson, Enrico Ferrero, J. Gale, Herbert James Gifford, William Asbury Greene, Dodgson Harbord, Charles William Hastings, William Henry Hyslop, Horace Handley O'Farrell, Sydney Platt, J.P., Douglas Pound Rodgers, Henry Stevens, Felix Joseph Vergara, Major George Hope Verney. The President and the Hon. Secretaries (*ex-officio*).

Bankers—Messrs. Martin & Co., 68 Lombard Street, E.C.

Hon. Secretaries—George Davison and Ernest George Spiers.

Carlisle and County Amateur Photographic Society.

ESTABLISHED 1885.

Indoor Meetings, first Tuesday in October, November, December, January, February, March, in Society's Room, Lowther Street, Carlisle. Annual Meeting, first Tuesday in February. Outdoor Meetings, once a month, as arranged.

President—The Mayor of Carlisle for the year.

Vice-President—C. S. Hall, M.R.C.S., F.R.M.S.

Committee—T. Bushby, J. Robson, J. H. Coward, T. Waugh, W. Gibson, J. G. Moffett.

Treasurer—John Forsyth.

Secretary—H. Y. Thompson, L.S.A. London, &c., Brampton, Carlisle.

Assistant Secretary—J. S. Atkinson, 33 Princess Street, Carlisle.

Chester Society of Natural Science (Photographic Section).

ESTABLISHED 1887.

Chairman—E. W. Parnell.

Committee—Dr. Kenyon, Dr. Taylor, F. Evans, C. W. Townshend, J. Wright.

Treasurer and Secretary—George Frater, 3 Lorne Street, Chester.

Cheltenham Photographic Society.

ESTABLISHED 1865.

Meetings are held on the second Thursday in each month, from November to April, both inclusive, at 4 Clarence Street, at half-past Seven p.m. Annual General Meeting the second Thursday in November.

President—Major-General Francis Dawson, C.B.
Committee—Baynham Jones, G. S. Penny, W. C. Beetham, and the Officers.
Treasurer—John Bull, County of Gloucester Bank.
Secretary—Clifford E. F. Nash, M.A., Glenfall Lawn, Cheltenham.

Coventry and Midland Photographic Society.

ESTABLISHED 1883.

Meetings held at the Provident Dispensary on the first Wednesday in each month. Annual Meeting held in December; date fixed at previous Ordinary Meeting.

President—Councillor Andrews.
Vice-Presidents—T. Baynton and H. W. Jones.
Committee—T. Lloyd, T. Owen, C. Waters, G. Winstanley, and the whole of the Officers.
Treasurer—E. J. Walker.
Secretary—J. S. Weatherilt, Springhill House, Keresley, near Coventry.

Derby Photographic Society.

ESTABLISHED 1884.

Ordinary Meetings, second Tuesday in each month, at Eight p.m., at Sykes's Restaurant, 33 Victoria Street, Derby. Annual Meeting, second Tuesday in October.

President—Captain W. de W. Abney, R.E., F.R.S., &c.
Vice-Presidents—R. Keene, J. C. Merry, J. W. Price, T. Scotton.
Committee—C. Bourdin, H. Bennett, T. Hills, W. G. Haslam, C. B. Keene.
Treasurer and Secretary—Edward J. Lovejoy, 73 Grove Street, Derby.

Dorset Amateur Photographic Association.

ESTABLISHED 1886.

President—W. Miles Barnes, M.A. (Cantab.).

Committee—G. Dawson-Damer, J.P., Dr. George, R. M. Lee, M.A., F. Dymond.

Hon. Secretary and Treasurer—E. J. Pope, M.A. (Oxon.), Bradford-Peverell, Dorchester.

Dundee and East of Scotland Photographic Association.

ESTABLISHED 1879.

Meetings in Lamb's Hotel, Dundee, first Thursday in each month from October to May inclusive. Annual Meeting in May.

Patron—The Right Hon. The Earl of Strathmore.

Hon. President—Thomas Carnelley, D.Sc., University College.

Acting President—G. D. Macdougald, F.I.C.

Vice-Presidents—J. K. Tulloch, M.B., and John Robertson.

Council—H. G. Fraser, J. Geddes, W. F. Hill, D. Ireland, P. Kerr, jun., G. G. Maclaren, W. M. Martin, J. Mathewson, Leslie Ower, J. R. Wilson.

Hon. Treasurer—V. C. Baird.

Hon. Secretary—James Rattray, 82 High Street, Dundee.

Edinburgh Photographic Society.

ESTABLISHED 1861.

Ordinary Meetings are held on the first Wednesday of each month, except July, August, and September, in the Professional Hall, 20 George Street, at Eight o'clock. The Annual Meeting is held in November.

Patron—H.R.H. The Duke of Edinburgh.

President—William Forgan.

Vice-Presidents—Hippolyte J. Blanc and W. T. Bashford.

Council—James Jameson, Robert H. Bow, C.E., James Lessels, J. M. Turnbull, J. C. H. Balmain, F. Briglmen, John Hay, Alexander A. Inglis, Alexander Ayton, Dr. Drinkwater, F.C.S., James McGlashan, F. P. Moffat.

Curator—Hugh Brebner.

Treasurer—Thomas Wardale.

Secretary—G. G. Mitchell, 2 Baxter Place.

Edinburgh Photographic Club.

Established 1881.

The Ordinary Meetings are held at 5 St. Andrew Square, at Eight o'clock p.m., on the third Wednesday of each month. The Annual Meeting on the third Wednesday of November. The Club is limited to Thirty Members.

Board of Management.

Convener—Dr. John Thomson, R.N.
Treasurer—James C. H. Balmain.
Secretary—James Jameson, 84 Pitt Street, Edinburgh.

Glasgow Photographic Association.

Established 1862.

Ordinary Meetings are held at the Philosophical Society's Rooms, 207 Bath Street, at Eight o'clock p.m., on the first Thursday of each month from October to April inclusive.

President—William Lang, jun., F.C.S.
Vice-Presidents—R. Dodd and A. Robertson.
Council—T. N. Armstrong, W. Brown, P. Falconer J. J. Moran, A. Mactear, J. Urie.
Treasurer—G. Bell.
Secretary—Daniel Robertson, Comely Bank, Dumbarton.

Glasgow and West of Scotland Amateur Photographic Association.

Established 1882.

Rooms, 180 West Regent Street, Glasgow. Meets on third Tuesday of each month, October to April, at half-past Seven p.m. Annual Meeting in January. Exhibition in November. Informal Meeting, every Tuesday at Eight p.m.

President—P. Falconer.
Vice-President—William Lang, jun.
Council—R. Dalglish, R. H. Elder, Thomas Taylor, A. Watson, William Miller, J. McKissack.
Treasurer—Hugh Reid.
Secretary—William Goodwin, 3 Lynedoch Street, Glasgow.

Glossop Dale Photographic Society.

ESTABLISHED 1883.

Meetings, first Tuesday in each month at Eight p.m.
President—Captain Partington.
Vice-Presidents—James Sidebottom and J. B. Rowcliffe.]
Chairman—Charles Greaves.
Vice-Chairman—James Merry.
Council—Messrs. Merry, Bamforth, Greaves, Broadhurst, Ridgway.
Librarian—S. Broadhurst.
Auditors—Messrs. Broadhurst and Thorp.
Hon. Treasurer—J. Hardman.
Hon. Secretary—W. E. Rowcliffe.

Gloucestershire Photographic Society.

Meetings are held at School of Science, Gloucester, from October to April.
President—George Embrey, F.C.S.
Committee—W. J. Jenkins, W. B. Wood, A. H. Pitcher.
Secretary—F. H. Burr, 8 Midland Road, Gloucester.

Gloucester School of Science Philosophical Society (Photographic Section).

Ordinary Meetings, fourth Tuesday in each month at Eight o'clock, at the School of Science, Brunswick Road.
President—George Embrey, F.C.S.
Hon. Secretary—F. H. Burr, 8 Midland Road.

Hampstead Photographic Club.

ESTABLISHED 1887.

Meets on second and fourth Mondays during the winter months at the Members' houses in turn, and once a month during the summer.
Hon. Treasurer—C. A. Watkins.
Hon. Secretary—A. R. F. Evershed, 29 Rosslyn Hill, Hampstead, N.W.

Halifax Photographic Club.

ESTABLISHED 1881.

Meet on the last Thursday evening in each month at half-past Seven p.m., in the Mechanics' Hall.

President—B. Rowley.

Vice-Presidents—Thomas Illingworth and E. J. Smith.

Council—The Officers of the Club and Five Ordinary Members.

Auditor—S. Goodman. *Treasurer*—G. H. Jackson.

Secretary—W. Clement Williams, 13 Akeds Road, Halifax.

Holmfirth Amateur Photographic Association.

ESTABLISHED 1885.

Meetings are held monthly on the first Tuesday of each month at half-past Seven, at the residences of each member in succession.

Council—The Members of the Association.

Hon. Treasurer—Thomas Brownson.

Hon. Secretary—Thomas Brownson, Binn Villa, Holmfirth.

Hull Amateur Photographic Society.

ESTABLISHED 1884.

Meetings held at the Rooms of the Hull Literary and Philosophical Society.

President—Sir A. K. Rollit, M.P.

Vice-President—C. F. Amos.

Council—George Bohn, C. D. Holmes, G. Shackles, Rev. G. Shafto, J. Stothard, J. Campbell Thompson.

Treasurer—H. W. R. Smith.

Joint Hon. Secretaries—David W. Sissons and H. W. R. Smith, 84 Beverley Road, Hull.

Hyde Photographic Society.

ESTABLISHED 1884.

Meetings every third Wednesday evening, from September to April inclusive, at the Society's Rooms, Mechanics' Institution, Hyde.

President—Dr. G. W. Sidebotham.

Vice-President—F. W. Cheetham.

Committee—J. T. Cartwright, W. H. Hulme, C. Bancroft, F. Bland.

Treasurer—J. H. Brooks.

Secretary—John Pennington, Great Norbury Street, Hyde, Manchester.

Kendal Literary and Scientific Institution (Photographic Section).

ESTABLISHED 1886.

Meetings held in the Museum Library on the second Wednesday in each month at half-past Seven p.m.

Chairman—F. W. Crewdson.

Committee—F. Armstrong, R. O. Pennington, Secretary of the Literary and Scientific Institution, Chairman and Secretary of the Photographic Section.

Hon. Treasurer and Secretary—Charles E. Greenall, Prospect, Kendal.

Leeds Photographic Society.

RE-ESTABLISHED 1881.

Meetings, first Thursday in each month, at the Philosophical Hall, at Eight o'clock. Annual Meeting, December.

President—Colonel Harding.

Vice-Presidents—Rev. A. Standidge and Thomas W. Thornton.

Committee—Messrs. Bothamley, Dawson, Denham, Redson, and Rodwell.

Hon. Secretary—S. A. Warburton, Waverley Terrace.

Leicester and Leicestershire Photographic Society.

Dates of Meeting—Second Wednesday in each month, at Mayor's Parlour, Old Town Hall. Recess—June, July, August, September.

President—George Bankart. *Vice-President*—C. Underwood.

Committee—George Toller, W. Sculthorp, W. T. Tucker, F. W. Broadhead.

Treasurer—W. Sculthorp.

Hon. Secretary—H. Pickering, Highcross Street.

Liverpool Amateur Photographic Association.

ESTABLISHED 1863.

The Ordinary Meetings are held on the last Thursday in each month, with the exception of December, and the Annual Meeting on the last Thursday in November. Meetings are held at the Royal Institution, Colquilt Street.

President—G. H. Rutter, 6 Lord Street, Liverpool.

Vice-Presidents—B. J. Sayce and F. T. Paul.

Council—H. N. Atkins, A. W. Beer, B. Boothroyd, J. H. Day, R. R. Gibbs, J. W. Kirby, G. A. Kenyon, M.D., P. Macdonald, P. H. Phillips, W. Rogers, E. Twigge, A. W. Cornish.

Hon. Treasurer—Joseph Earp, 50 Falkland Road, Egremont.

Hon. Secretary—W. A. Watts, Marshville, Farnworth, Widnes.

London and Provincial Photographic Association.

ESTABLISHED 1882.

Meetings held at Mason's Hall Tavern every Thursday evening at Eight o'clock.

Trustees—J. Traill Taylor and J. B. B. Wellington.

Committee—W. M. Ashman, T. Bolas, F. A. Bridge, J. T. Collins, A. Mackie, L. Medland, H. M. Smith, C. H. Trinks.

Curator—A. Haddon.

Treasurer—W. H. Prestwich.

Secretary—J. J. Briginshaw, 128 Southwark Street, S.E.

Manchester Amateur Photographic Club.

ESTABLISHED 1883.

Meetings are held at the Star Hotel, Deansgate, third Wednesday in each month.

Committee—J. W. Leigh, T. Sefton, J. T. Foster, T. W. Steventon, J. G. Jones.

Treasurer—E. Openshaw.

Secretary—E. Openshaw, 24 Ward's Buildings, Deansgate, Manchester.

Manchester Photographic Society.

ESTABLISHED 1855.

Meetings held at 36 George Street, second Thursday in month from September to May inclusive, at half-past Six. Annual Meeting, October. Outdoor Meetings fortnightly from May to October.

Lantern Committee.—Established 1885.—Meetings, fourth Wednesday from September to March inclusive.

President—A. Coventry.

Vice-Presidents—Canon Beechey, J. S. Pollitt, S. D. McKellen, Abel Heywood, jun., Allan Garnett.

Council—Jos. Greatorex, A. Brothers, J. Schofield, O. Muth, N. Wright, Dr. C. P. Bahin, R. Atherton, Thos. Chilton, J. G. Jones, S. F. Flower.

Treasurer—W. G. Coote.

Secretary—W. I. Chadwick, Grosvenor Square, Brooklands, Manchester.

Lantern Section Committee—W. I. Chadwick, F. S. Flower, Jos. Greatorex, J. G. Jones, O. Muth, J. Schofield, W. Watts.

Manchester Amateur Photographic Society.

ESTABLISHED 1885.

The Ordinary Meetings on the second Tuesday in each month, at the Masonic Hall. Annual Meeting last Tuesday in January.

President—Rev. H. J. Palmer, M.A.

Vice-Presidents—S. F. Flower and William Stanley.

Committee—John Bathe, Jas. Blair, J. Davenport, John Furnivel, W. Lane, E. Openshaw, H. Smith, T. Steventon, John Tatham, M.D., B.A., B. B. Wilson,

Treasurer—J. G. Jones.

Librarian—George H. B. Wheeler.

Recording Secretary—William Stanley.

Corresponding Secretary—F. W. Parrott, 53 Chapel Street, Salford.

Newcastle-on-Tyne and Northern Counties' Photographic Association.

ESTABLISHED 1881.

Meetings held at the College of Physical Science, Newcastle, on the second Tuesday of each month, except June, July, August, and September.

President—Professor A. S. Herschel, M.A., &c.

Vice-Presidents—Alex. Shannon Stevenson, J.P., and J. Buxton Payne, F.R.M.S.

Council—Messrs. W. Armstrong, Auty, Downey, W. C. Fletcher, Galloway, J. P. Gibson, Jackson, H. R. Procter, Sawyer, Templeton.

Hon. Treasurer—P. M. Laws, 38 Blackett Street, Newcastle.

Hon. Secretary—J. Pike, 16 New Bridge Street, Newcastle.

North London Photographic Society.

ESTABLISHED 1885.

The Ordinary Meetings are held on the first and third Tuesday in every month at Myddelton Hall, Islington, N. Excursions every Saturday afternoon from Easter to Michaelmas.

President—J. Traill Taylor.

Vice-Presidents—A. Mackie and E. Clifton.

Council—F. W. Cox, W. Few, J. Humphries, John Jackson, L. Medland, John Nesbit, John Oakley, F. G. Reader.

Curator—E. Traill Hiscock.

Treasurer and Secretary—Hedley M. Smith, 5 Beatrice Road, Stroud Green, N.

North Staffordshire Amateur Photographic Association.

ESTABLISHED 1883.

Meetings, Eight o'clock, first Wednesday in each month, at the Mechanics' Institute, Hanley.

President—Charles Alfieri.
Vice-President—T. Taylor.
Council—Messrs. Emery, Hampton, Burgess, Insull.
Treasurer—W. E. Leek.
Secretary—W. B. Allison, Prince's Terrace, Hartshill, Stoke-on-Trent.

Nottinghamshire Amateur Photographic Association.

ESTABLISHED 1884.

Meetings, first and third Tuesday in the months of October, November, December, January, February, March, April, and May, at the Nottingham Institute, Shakespeare Street. Annual Meeting in October.

President—Henry Blandy.
Vice-President—G. A. Bull.
Committee—T. Carnell, W. J. Collings, B. S. Dodd, J. Johnston, P. E. Knight, J. C. Lancaster, F. J. Oakhill, G. Shepperley, C. Spray, H. Tolley, H. A. A. Wigley, G. E. Williamson.
Treasurer—N. W. Need.
Secretary—G. E. Inger, 7 High Street, Nottingham.

Oldham Photographic Society.

ESTABLISHED 1867.

All Meetings are held at the Lyceum, Union Street, Oldham. Monthly Meetings on the last Thursday in each month, in the Club Room, at a quarter to Eight p.m. Weekly Meetings every Thursday evening, in the Society's Room from Seven to Ten. The Annual Meeting is held on the last Thursday in October.

President—John Greaves, jun.
Vice-President—Tom Heywood.
Council—John Chadwick, John William Cooper, Edward H. Dixon, John Fullalove, James Hall, James Henry Prestwich, Wallace Thompson.
Librarian—Moses Piper.
Treasurer—John William Whitehead.
Secretary—Thomas Widdop, 18 Crossbank Street, Oldham.

Oxford University Photographic Club.

ESTABLISHED 1884.

Meetings held at Eight o'clock every other Thursday or Friday during Term in the Club Rooms.

President—G. S. Edwards, 16 Crick Road.
Committee—A. Anson, H. S. Salter, Hon. Secretary, President, Treasurer.
Treasurer—Arthur P. Harper, Christ Church.
Secretary—F. W. Bennett, New College, Oxford.

Paisley Photographic Society.

RE-ESTABLISHED 1885.

Monthly Meeting of Society at Eight p.m., first Tuesday of each month, October to April, in Paisley Museum.

President—Hugh H. Smiley.
Vice-President—James Barr.
Council—W. A. L. Peock, A. Fullerton, G. Robertson, J. Symington, J. Donald.
Treasurer—Matthew Morrison.
Secretary—Robert Cairns, Castlehead, Paisley.

Peterborough Photographic Society.

ESTABLISHED 1887.

Meetings, monthly. First Monday in the month.
President—G. Kirkwood, M.D.
Vice-Presidents—Very Rev. the Dean of Peterborough, Rev. Canon Argles Dr. Walker, Dr. Easby, J. H. Pearson, H. Hetley, — Worthington.
Hon. Secretary—A. C. Taylor, The Infirmary, Peterborough.

Photographic Club.

ESTABLISHED 1879.

Ordinary Meetings every Wednesday at Eight o'clock. Annual General Meeting, first Wednesday in November.

Trustees—William Ackland and T. Charters White.
Committee—W. Bedford, W. Cobb, A. Cowan, E. W. Foxlee, A. Mackie, J. Nesbit, J. B. B. Wellington, J. W. Zaehnsdorf.
Treasurer and Secretary—E. Dunmore, 1 Beacon Hill, Camden Road, N.

Photographers' Benevolent Association.

ESTABLISHED 1873.

Meetings as required.

President—J. Traill Taylor.

Trustees—Captain W. de W. Abney and W. S. Bird.

Committee—W. M. Ashman (*Chairman*), T. J. Collins (*Deputy Chairman*), T. Bolas, W. Bedford, F. H. Berry, J. J. Briginshaw, E. Clifton, H. M. Hastings, J. Hubert, A. Mackie, C. Pearce, J. S. Rolph, F. Shea, H. M. Smith, J. Zaehnsdorf.

Treasurer—John Stuart, 112 New Bond Street, W.

Secretary—H. Harland, 181 Aldersgate Street, E.C., and 83 Hawksley Road, Stoke Newington, N.

Photographic Society of Great Britain.

ESTABLISHED 1853.

The Ordinary Meetings are held at the Gallery of the Royal Society of Painters in Water Colours, 5A Pall Mall East, at Eight o'clock p.m., on the second Tuesday of each month from November to June inclusive. Annual General Meeting on the second Tuesday in February. Extra Meetings, called 'Technical Meetings,' are held on the fourth Tuesday in each month.

Patrons—Her Majesty the Queen and H.R.H. the Prince of Wales.

President—J. Glaisher, F.R.S., F.R.A.S., 1 Dartmouth Place, Blackheath, S.E.

Vice-Presidents—Captain W. de W. Abney, R.E., F.R.S., F.C.S., W. England, H. P. Robinson.

Council—C. E. Abney, G. L. Addenbrooke, W. Bedford, Valentine Blanchard, T. Bolas, F.C.S., J. Cadett, Francis Cobb, William Cobb, Alexander Cowan, T. Sebastian Davis, F.C.S., W. F. Donkin, M.A., F.C.S., F.I.C., P. H. Emerson, B.A., M.B. Cantab., John Spiller, F.C.S., F.I.C., J. Traill Taylor, Leon Warnerke, H. Trueman Wood, M.A., Colonel H. Stuart-Wortley.

Treasurer—Walter S. Bird.

Hon. Secretary—W. F. Donkin, M.A., F.C.S., F.I.C., 142 Sinclair Road, Hammersmith, W.

Assistant Secretary—Edwin Cocking, 5A Pall Mall East, S.W.

Photographic Society of Ireland.

ESTABLISHED 1879.

Meetings, at Eight p.m., in the Royal College of Science, Dublin, second Friday of the month, October to May inclusive.

President—Dr. J. Emerson Reynolds, F.R.S.

Vice-President—Sir Howard Grubb.

Council—Samuel Baker, Herbert Bewley, Thomas Mayne, M.P., Fitzadam Millar, George Mansfield, J.P., Greenwood Pim, John L. Robinson, John V. Robinson, Dr. Scott, Joseph H. Woodworth.

Treasurer—Thomas Arthur Bewley.

Secretaries—Alex. Conan, 1 Carlton Villas, Shelbourne Road, Dublin, and E. P. Johnson, 30 Upper Mount Street, Dublin.

Postal Photographic Society.

ESTABLISHED 1882.

Annual Meeting in June. Committee Meetings four times a-year.

President—Horace Day, M.D.

Committee—A. Bryans, Rev. W. Miles Barnes, H. N. Malan, R. Tindall, W. Withall.

Hon. Secretary—William Mortimer Baylis, 4 Middle Temple Lane, E.C.

Stockton Amateur Photographic Association.

Meetings, second Tuesday in each month.

President—C. Arthur Head. *Vice-President*—J. H. Draper.

Committee—J. Byers, W. Clarke, F. A. Graham, W. K. Hunton, W. Hodgson, J. H. Jackson.

Hon. Secretary and Treasurer—Frank Appleby, 2 Rosslyn Terrace.

Sheffield Photographic Society.

ESTABLISHED 1876.

Meetings are held at the Masonic Hall, Surrey Street, first Tuesday in the month, at half-past Seven o'clock, p.m. Annual Meeting, first Tuesday in October.

President—Thomas Firth.

Vice-Presidents—A. S. Platts and T. S. Yeomans.

Council—W. H. Bacon, W. B. Hadfield, Jonathan Taylor, Joseph Taylor, T. G. Hibbert.

Treasurer—Charles Yeomans.

Hon. Secretary—J. W. Charlesworth, 165 Sheffield Moor.

Assistant Hon. Secretary—E. Beck.

Shropshire Amateur Photographic Society.

ESTABLISHED 1886.

President—E. Cresswell Peele.

Vice-President—H. H. Hughes.

Council—W. Bowdler, Rev. J. H. E. Charter, W. E. Litt, H. Mountfort, E. Lloyd Oswell, J. Pyefinch, F. W. Williams.

Treasurer—M. J. Harding.

Hon. Secretary—Walter W. Naunton, 9 The Square, Shrewsbury.

Sutton Scientific Society.

ESTABLISHED 1886.

Meetings are held at Eight p.m. on the first Tuesday in every month at the Rooms of the Society, 18 High Street, Sutton, Surrey.

Photographic Sub-Committee.

Chairman—William Goode. *Recorder*—James L. McCance, F.R.A.S.

The Photographic Convention of the United Kingdom.

Offices, 128 Southwark Street, London, S.E.

Chairman of Council—J. Traill Taylor.

Council—Consists of forty members and representatives of London and Provincial Societies.

Hon. Secretary—J. J. Briginshaw, 128 Southwark Street, London, S.E.

The Teachers' Photographic Society.

President—Rev. A. Johnson, M.A., F.L.S., Head Master, St. Olave's Grammar School, Southwark.

Committee—S. G. Bonner, Cubitt Town Board School, E.; J. Colman, Oatlands Park School, Surrey; W. Freeman, Mason's Hill School, Bromley, Kent; W. H. Gillham, 89 Drummond Road, S.E.; A. P. Wire, Harrow Green Board School, E.

Treasurer—W. Rice, 86 Fleet Street, E.C.

Secretary—G. A. Freeman, B.Sc., F.G.S., St. Olave's Grammar School, S.E.

Ulster Amateur Photographic Society.

ESTABLISHED 1887.

Meetings are held at the Museum on the second Monday of each month from October till April inclusive, at half-past Seven p.m.

President—Professor Letts, Ph.D., F.R.S.E., F.C.S.

Vice-Presidents—James Stelfox and James Wilson.

Committee—J. J. Andrew, John Brown, William Firth, William Gray, Cecil E. Shaw, George G. Ward.

Hon. Treasurer and Secretary—Edward Braddell, Malone Park, Belfast.

Wallasey Photographic Association.

ESTABLISHED 1886.

The General Meetings are held at 12 Bradford Terrace, Seacombe, on the first Wednesday of the month. Annual Meeting, first Wednesday in November.

Chairman—H. Wilkinson.

Committee—Messrs. Mayall, Walker, Hill, Bardsley, Wilson, Nicholson.

Auditor—James Fullerton. *Hon. Treasurer*—J. W. Ashurst.

Hon. Secretary—George B. Frost, 3 St. Paul's Terrace, Seacombe, Cheshire.

Assistant Secretary—John William Gregg.

Yorkshire College Photographic Club.

ESTABLISHED 1883.

Meetings are held in the College on the last Thursday in each month during the session. Annual meeting in June. Excursions during the summer.

President—C. H. Bothamley, F.I.C., F.C.S.

Committee—W. Cleland, B.Sc., A. E. Nichols, E. M. Nelson.

Hon. Secretary and Treasurer—Harry B. Hall, 20 Regent Terrace, Hyde Park Road, Leeds.

Amateur Photographic Association of Victoria.

The Ordinary Meetings are held at the Royal Society's Hall, Melbourne, on the first Monday of each month.

President—J. H. Browning, M.D.

Vice-Presidents—E. C. Bell and F. A. Kernot.

Committee—C. Harper, J. H. Mulvany, E. J. Hughes, H. D. Grieve, J. Lang.

Hon. Librarian—E. A. Walker. *Scientific Custodian*—E. W. Purton.

Hon. Treasurer—J. J. Fenton. *Hon. Secretary*—J. H. Harvey.

Queensland Photographic Society.

ESTABLISHED 1884.

Ordinary Meetings held on the 15th of each month.

President—Hon. A. C. Gregory, M.L.C., F.R.G.S.

Vice-Presidents—Professor J. H. Pepper, J. W. Sutton, W. C. Hume.

Committee—D. T. Lyons, T. Mirfin, H. W. Fox.

Librarian—F. R. Hall. *Treasurer*—C. A. Gilder.

Hon. Secretary—C. M. Allen, Diocesan Registry, George Street, Brisbane.

AMERICAN PHOTOGRAPHIC SOCIETIES.

Association of Operative Photographers of New York.—Established 1880. Meetings first and third Wednesdays each month. Annual Meeting, first Meeting in March, at Eight o'clock p.m. Meetings held at 392 Bowery. Thomas W. Power, President. Thomas C. Roche, Vice-President. D. Fields, O. Buehler, A. Mildenberger, Trustees. Emil Stoll, Treasurer. William Eddowes, Secretary, 770 Broadway, New York City. C. Sprotte, Financial Secretary. C. Faulkner, Librarian.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Baltimore Amateur Photographic Association.—Meets on the first Thursday in each month. Executive and Annual Meetings in October. John P. Bigham, President. Philip Prado, Vice-President. Arthur W. Nyce, Secretary and Treasurer, 26 North Gay Street, Baltimore, Maryland.

Boston Society of Amateur Photographers.—Established October, 1882. E. F. Wilder, President. G. E. Cabot, Vice-President. J. H. Thurston, Secretary and Treasurer.

Chicago Amateur Photographers' Club.—Established 1883. Place of Meeting, The Art Institute, Van Buren Street, and Michigan Avenue. Regular Meetings, third Monday evening in each month. Annual Meeting, third Monday in January. Dr. H. D. Garrison, President. E. Wyllys Andrews, M.D., Vice-President. Gayton A. Douglass, S. W. Burnham, G. W. Hough, Executive Committee. Henry L. Tolman (*vice* F. H. Davies, resigned), Treasurer and Secretary, *Chicago Tribune*, care of City Editor.

Chicago Photographic Association.—Established 1871. Place of Meeting, 229 State Street. Ordinary Meetings, first Wednesday evening in each month. Annual Meeting, first Wednesday in January. G. H. Sherman, Elgin, Ills. Charles Gentile and P. B. Greene, Vice-Presidents. Gayton A. Douglas, Thomas Markley, and Dr. H. D. Garrison, Executive Committee. F. H. Davies, 88 Walton Place, Chicago, Treasurer and Secretary.

Cleveland Amateur Photographic Association.—Meets at the residences of the Members, twice in each month, on Monday evenings, at half-past Seven o'clock. Wm. T. Higbee, President. A. H. Hough, 804 Case Avenue, Secretary and Treasurer.

Cleveland Camera Club.—Established January 25, 1887. Meetings held at 13 Euclid Avenue first and third Tuesdays of each month, at Eight o'clock p.m. Annual Meeting occurs first Tuesday in January. Special Meeting called by President. Rev. Dr. Charles S. Pomeroy, President. Dr. Robert Dayton, Vice-President. Arthur D. Cutter, Treasurer. William T. Higbee, 721 Prospect Street, Secretary.

Columbus (Ohio) Amateur Photographic Club.—Established 1884. Meetings the third Monday of each month, at Art School Rooms, 15 East Long Street. Professor A. H. Tuttle, President. Professor Walter S. Goodnough, 101 Hamilton Avenue, Columbus, Ohio, Secretary and Treasurer.

Detroit Photographic Association.—Annual Meeting second Monday in January. Jex Bardwell, President. Albert M. Harris, Vice-President. Judge, J. J. Speed, D. Farran Henry, and Wm. Marratt, Council. William H. Allen, Treasurer. C. W. Earle, Secretary.

German Photograghic Society of New York.—Meets at 62 East Fourth Street, on the second and fourth Fridays of each month, at half-past Eight o'clock. Annual Meeting on the fourth Friday in March. Theodor Gubelman, President. Chas. F. Kutscher, Vice-President. L. Nagel, F. Bach, and A. Denniger, Trustees. G. E. Pellnitz, Treasurer. Ludwig Schill, Corresponding Secretary, 839 Broad Street, Newark, N.J.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Lowell Association of Amateur Photographers.—Established 1884. Holds occasional Meetings and an Annual Exhibition. William P. Atwood, President. A. G. Walsh, Vice-President. Officers constitute Executive Committee. Frank H. Pullen, Treasurer. R. F. Hemenway, 38 Fourth Street, Lowell, Mass., U.S.A., Secretary.

Minneapolis Amateur Photographic Club.—Established 1885. Meetings held at Room 15 Windom Block, the second Monday in each month, at Eight p.m. Annual Meeting in September. A. C. Loring, President. E. R. Shepard, Vice-President. A. C. Loring, R. D. Cleveland, O. W. Meyrowitz, Bishop Brayton, and O. H. Peck, Executive Committee. Bishop Brayton, Treasurer. R. D. Cleveland, 221 Second Avenue South, Minneapolis, Minn., Secretary.

Pacific Coast Amateur Photographic Association.—Established February 19, 1883. Annual Meeting, March 3. Ordinary Meetings are held on the first Thursday after the first Monday in each month at 605 Merchant Street, San Francisco, California. George Tasheira, President. A. J. Treat, Vice-President. Messrs. Clinton, Day, J. L. Cherry, and W. S. Davis, Executive Committee. H. S. Herrick, Room 22, 325 Montgomery Street, San Francisco, California, U.S.A., Treasurer and Secretary.

Pennsylvania Photographic Association.—Established 1870. Time of Meeting, second Tuesday evening of each month, at 1431 Ridge Avenue, Philadelphia, Pa. Hour of Meeting, half-past Seven o'clock. John C. Steinman, President. David Marston and Thomas McCollin, Vice-Presidents. J. G. Hood, J. G. Tyson, and F. Normast, Executive Committee. John R. Clemons, Treasurer. Thomas T. Mahan, 1912 Jefferson Street, Secretary.

Philadelphia Amateur Photographic Club.—Established December, 1883. Meetings are held at Club Rooms, 907 Filbert Street, at Eight p.m., on the third Monday of each month. Howard Pusey, President. H. P. Gillingham, Vice-President. F. G. Stuart, Chairman of Executive Committee. Alfred Thompson, Treasurer. W. West Randall, 1905 Chestnut Street, Philadelphia, Secretary. Amateurs visiting our city in need of a dark room are invited to make use of ours. Rooms open day and night.

Photographic Section of Cincinnati Society of Natural History.—Established December, 1881. Meets on the first and third Thursdays in the month, at Eight p.m. in winter, and Four p.m. in summer. Dwight Huntington, President. E. B. Johnston, Vice-President. The President, Vice-President, Secretary, and Treasurer are the Executive Committee. There are also Special Committees on Lantern Exhibits (annual), Excursion (annual), &c. T. H. Kelley, Treasurer. C. L. Harrison, 108 Broadway, Cincinnati, O., Secretary.

Photographic Section of the American Institute.—Established March 26, 1859. Regular Meetings at Eight p.m. on the first Tuesday of each month, except July and August, at Rooms of the Institute in Clinton Hall. Annual Meeting, first Thursday in February. Henry J. Newton, President. John B. Gardner, Vice-President. The American Institute Committee on Chemistry and Optics, Committee. Edward Schell, Treasurer. Oscar G. Mason, Photographical Department, Bellevue Hospital, New York City, Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Photographic Society of Chicago.—Established 1884. The regular Monthly Meetings of the Society held at the Art Institute, corner of Michigan Avenue and Van Buren Street, first Tuesday in each month. Annual Meeting, first Tuesday in January. Professor G. W. Hough, President. Judge Bradwell and F. F. Charles, Vice-Presidents. L. W. Felt, R. P. Harley, and Dr. H. D. Garrison, Executive Committee. H. L. Tolman, Treasurer. C. Gentilé, 298 Dearborn Street, Chicago, Ill., Secretary.

Photographic Society of Philadelphia.—Established 1862. Stated Meetings, first Wednesday in each month, at Eight p.m. Conversational Meetings, third Wednesday in each month, at 31 South Fifteenth Street. Frederic Graff, President. John G. Bullock and Joseph H. Burroughs, Vice-Presidents. Galloway C. Morris, John G. Bullock, and Joseph H. Burroughs, Executive Committee. S. Fisher Corlies, Treasurer. Robert S. Redfield, 1601 Callowhill Street, Philadelphia, Pa., Secretary.

Portland Camera Club.—Frank Woolsey, President. W. F. Woodward, Secretary. W. W. Bretherton, Corresponding Secretary.

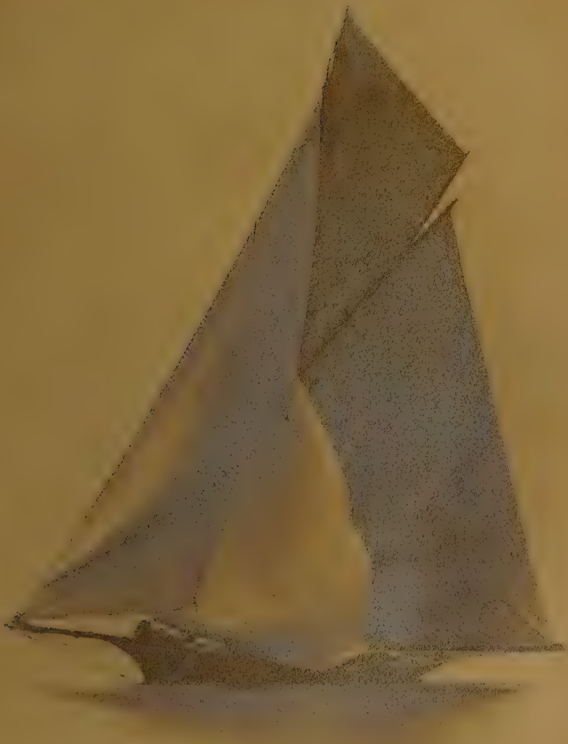
Rochester Photographic Association.—Meets on the first and third Monday of each month, at Eight o'clock. Election of Officers, first Meetings in May and November. S. D. Wardlaw, President. S. Miller, Vice-President. Fred. Stone, George Bacon, and Willis Bannister, Finance Committee. Frank Knapp and W. J. Lee, Executive Committee. J. M. Fox, Treasurer. W. H. Learned, Secretary.

Society of Amateur Photographers of New York.—Organized March 28, 1884. Incorporated June 9, 1885. Annual Meetings held at the Rooms of the Society, 122 West Thirty-sixth Street, New York, on the second Tuesday in April of each year, at Eight o'clock p.m. Regular Monthly Meetings are held at the Rooms on second Tuesday of each month at Eight p.m. Specia. Meetings on call of the President. Membership at this date, 215. Dexter H. Walker, President. George R. Allerton, Vice-President. Board of Directors eleven in number, elected annually from among active members of the Society Henry V. Parsell, Treasurer. John T. Granger, 1 Broadway, New York City Secretary.

St. Louis Association of Amateur Photographers.—Established October, 1885. Robert E. M. Bain, President. Rev. C. M. Charropin, S.J. Vice-President. J. Withnell Dunn, Dr. C. H. Goodman, H. B. Alexander, with the President as ex-officio Member and Chairman, Executive Committee. W. W. Withnell, Treasurer. James A. Sherrard, Eighth and Locust Streets, St. Louis, Mo., Secretary.

St. Louis Photographic Association.—No regular time set for Meetings. Secretary sends out invitations when necessary. G. Cramer, President. John Fischer, Treasurer. R. Benecke, care of G. Cramer, Dry Plate Works, St. Louis, Mo., Secretary.

The Pioneer Amateur Photographic Club of Brooklyn.—Meets at Eight o'clock, South Oxford Street, Brooklyn, on the first Monday in each month from November to July. Lewis Atkinson, President, Edward Moran, Geo. W. Street, and Gilbert A. Robertson, Committee on Admissions. Dr. Skidmore Hendrickson, 636 St. Mark's Avenue, Brooklyn, Secretary.



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CONTINENTAL PHOTOGRAPHIC SOCIETIES.

Association Belge de Photographie.—Established 1874. Dr. Candèze, President. Baron R. de Sélys-Longchamps and de Blochouse, Vice-President. Colard, Rutot, Massange de Louvrex, Géruzet, Lamarche, Puttemans, Storms, Maes, and Herry, Committee. Sections: Brussels, Gent, Liège, Antwerpen. Capitaine L. Massaux, Treasurer. O. Campo, 37 Rue Souveraine, Brussels, Secretary.

Dansk Fotografisk Forening.—Established 1878. J. Petersen, President. Chr. Neuhaus, Vice-President. Hilmar Crone, Johannes Petersen, and C. F. L. Galle, Committee. Chr. Neuhaus, Treasurer. C. F. L. Galle, Gothersgade, 15 Kjöbenhavn K., Secretary. The Meetings are held the last Monday in September to April, at Eight o'clock, by Wittmack and Rüse, Holmens Canal 17.

Deutscher Photographen Verein.—Established 29 December, 1876. K. Schwier, Weimar, President. Fr. Müller, München, Amalienstr. 9, Vice-President. C. Kindermann (Fr. Benque & Kindermann), Hamburg, gr. Bleistrasse, 30, and Gg. Brokesch, Leipzig, Zeitgerstr. 2, the Beisitzer. Karl F. Wunder, Hannover, Friedrichstr. 8a, Treasurer. F. Tellgmann, Mühlhausen in Thüringen, Secretary. K. Schwier, Weimar, Corresponding Secretary. Jährlich 1 Wanderversammlung; für 1889, August, in Lübeck.

Internationaler Photographen Verein, 'Victoria.'—Established 1882. H. Dieterich, Guben, President. A. Schulz, Königswalde, Vice-President. Th. Weiss, Guben, E. Berger, Grünberg, R. Ochs, Frankfort-on-Oder, H. Wegener, Freienwalde, Committee. Carl Grall, Guben, Treasurer and Secretary.

Münchener Photographische Gesellschaft.—Established 1879. Franz Werner, President. Otto Perutz, Treasurer. Paul Zschokke, Landwehrstrasse, 31, München, Secretary.

Photographische Gesellschaft, Hamburg, Altona.—Established November 4th, 1873. G. Wolf, Hamburg, President. Th. Petersen, St. Pauli, Vice-President. Herm. Boock, C. W. Lüders, Kunstschleifer, Committee. W. Köhnen, Altona, Treasurer. H. Boock, Bergstrasse, 26. Meets first Tuesday in the month, at 8 p.m., at Gerhafstrasse, 10, Hamburg.

Photographische Gesellschaft in Wien.—Established 1861. Ottomar Volkmer, President. Achilles von Melingo, Vice-President. Carl Angerer, Victor Angerer, Dr. T. M. Eder, Carl Haack, Oscar Kramer, Josef Löwy, Wilhelm Freiherr von Schwarz-Lenborn, Robert Sieger, Josef Szekely, Victor Toth, and Carl Wrabetz, Committee. Ludwig Schrank, Treasurer. Professor Fritz Lukhardt, Secretary. Bureau of the Society, Wien III. Hauptstrasse, 9. Ordinary Meetings are held from October to May, every first Tuesday in the month, in the Rooms of the Kaiserliche Akademie der Wissenschaften. January Meeting is the Annual.

CONTINENTAL PHOTOGRAPHIC SOCIETIES—*Continued.*

PHOTOGRAPHISCHER VEREIN ZU BERLIN.—Established 1863. Dr. Fr. Stolze, President. Dr. F. Stinde and Carl Suck, Vice-Presidents. Paul Grundner, F. Funk, C. Georgi, C. Brasch, and G. Braun, Committee. F. Schüler, F. Funk, Paul Grundner, Albert Schwartz, and Carl Suck, Technical Examination Commission. E. Martini, Treasurer. Albert Schwartz, Luisenstrasse, 23, Berlin, N.W. Meetings on the first and third Thursday in the month, at Kaiserhallen u. den Linden, 27.

SOCIÉTÉ FRANÇAISE DE PHOTOGRAPHIE, Paris, 20 Rue Louis-le-Grand.—Established 1874. M. Péligot (de l'Institut), President. M. A. Davanne, Vice-President. Comité d'Administration, Committee. M. Audra, Treasurer. M. Perrot de Chaumeux, Secretary. S' adresser pour tous renseignements à M. E. Cousin, Secrétaire-agent, 20 Rue Louis-le-Grand. Assemblé le premier vendredi de chaque mois sauf en Septembre et Octobre. Publication: *Bulletin de la Société Française de Photographie* (mensuel).

SOCIÉTÉ NANTAISE DE PHOTOGRAPHIE.—Established 1881. Alfred Bascher, President. Lt.-Colonel du Hanlay, Vice-President. MM. Bruneau, Toublanc, and David, Committee. Em. Tassain, Treasurer. Paul Crémant, Rue d'Alger, 13, Nantes, Secretary. Siège social au Cercle des Beaux-Arts. Laboratoire et galerie passage Raymond, 7. Réunion le premier vendredi de chaque mois, à huit heures du soir.

SOCIÉTÉ VERSAILLAISE DE PHOTOGRAPHIE, à Versailles (Seine et Oise).—Dutilleux, 19 Avenue de Picardie, President. Mathieu, Rue des Réservoirs, Vice-President. Il n'y on pas de Commission spéciale. La Société se réunit à la Mairie le 1er mardi de chaque mois. Elle publie un bulletin mensuel et fait chaque année une exposition des œuvres de ses membres. Gavin, Rue du Potager, Secretary. René Gast, Rue Ste. Victoire, 11, Secretary.

VEREIN BERLINER PHOTOGRAPHEN GEHILFEN.—Established March 1st, 1876. Paul Meyer, Treskow Strasse, 37, President. H. Aschenbrenner, Treasurer. Paul Meyer, Treskow Strasse, 37. Meets every Thursday at 8.30 p.m.

VEREIN ZUR FÖRDERUNG DER PHOTOGRAPHIE.—Established 1869. Dr. H. W. Vogel, President. Dr. Zenker, Vice-President. Heinrich Graf, Haberlandt, Halwas, H. Toop, and E. Milster, Committee. M. Bergmann, Treasurer. C. Quidde, Buckower Strasse 1, 2, S. Berlin, Secretary.

VEREIN ZUR PFLEGE DER PHOTOGRAPHIE UND VERWANDTER KÜNSTE, FRANKFURT A. MAINE.—Established 1875. H. P. Hartmann, Frankfurt a. Main, President. T. Bamberger, Frankfurt a. Main, Vice-President. C. Reutlinger and Herm. Maas, Frankfurt a. Main, H. v. Ayx, Mainz, and W. Bellot, Darmstadt, Committee. C. Böttcher, Frankfurt a. Main, Treasurer. F. W. Geldmacher, Frankfurt a. Main, Secretary. Th. Haake, i. firma Haake & Albers, Frankfurt a. Main, Assistant Secretary. Dr. C. Schleussner, Bibliothekar. Jeden 1 Montag im Monat. Im Januar Generalversammlung. Restaurant 'Pfeifer,' Shirfergasse, Frankfurt a. Main.

SUMMARY.

If the year now drawing to a close has not been characterised by any startling invention or discovery in the art-science of photography, it has yet been marked by certain advances which, although made almost insidiously, are nevertheless of a solid nature, and leave the state of the art in a condition more advanced than it was found at the advent of the year.

Public taste has been educated to the extent of accepting pictures in which the tones are of an engraving black in contradistinction to the purples and browns of former times, and a healthy feeling has been generated as to their superior permanence. Enlargements in black tones are being extensively produced by amateurs as well as professional photographers, for owing to improvements in bromised paper, and facilities in working on it even by artificial light, it has now been brought easily within the scope of those who like to practice it almost by way of pastime.

Judging by the immense number of patents which have within the year been applied for, photographic invention has been stimulated to a high pitch, although reasoning from the experience of a past year, it is probable that only a very limited number of them will be brought to maturity.

It is in the realm of photo-micrography that the most striking popularity has been achieved of late. By contrast with other departments recently taken up, the entrants into this field have been indeed exceedingly numerous. These having the high standard of excellence attained by skilled workers of a previous time to work up to, aided by their counsels, and assisted by optical appliances of a high class, backed by a praiseworthy spirit of emulation and perseverance, have in many instances taken a high position almost at the outstart.

Several new photographic societies have been formed, and the list of those given in a previous page as being in active operation is surprisingly large. Although the Parent Society, as that of Great Britain is affectionately designated, has not of late been taking an active part in leading photographic opinion, yet owing to a reconstructed constitution and revised laws soon about to take effect, it is to be hoped that it will ere long compete successfully with its now numerous and exceedingly active metropolitan offshoots and take its place in the front.

With the exception of a successful endeavour to increase the working apertures of lenses, especially those of the single landscape class, the optics of photography as it exists practically in commerce or manufacture stands very much where it did at the commencement of the

year. The new Abbè glass, however, is being largely experimented with, and the result will doubtless be apparent before long.

It is gratifying to be able to record that Mr. Carey Lea is once more able to enter the field of investigation. His researches in photo-chloride of silver published during this year form an exceedingly valuable contribution to the scientific department of photography.

One feature in photographic practice deserves notice, that is, the unusually great increase in the number and varieties of cameras of the detective class, and of those who make use of this attractive method of securing passing scenes 'themselves unseen.' This has led to increased efficiency in the lenses required for such cameras, and which necessarily demand a large aperture coupled with good definition.

Orthochromatic or isochromatic photography is still continuing to make way, and in the following pages several valuable communications respecting its latest developments will be found contributed by our most experienced experimentalists.

A method of taking portraits by an instantaneous flashing light, composed of magnesium powder mixed with a pyrotechnic compound, which was publicly introduced and practised in this country more than twenty years ago, has been reinvented by a German firm, and patents for its employment secured in several countries. A clever outcome of the idea is due to a New York scientist who obtains the desired end by the ignition of gun cotton with which is incorporated magnesium filings, thus securing a quick flash of great luminosity.

Among those removed by death during the year are three whose names have been long associated with photography, Robert Hunt, Major Russell, and J. G. Tunny. Professor Hunt in the very earliest times of the art, even before photography could be said to have become an art, rendered inestimable service by the publication of his *Researches on Light*, and subsequently by other works. Major Russell, since Colonel, by his various contributions to the literature of photography, his tannin process, and especially by his discovery of the restraining properties of a soluble bromide in the developer, had made his mark long before he retired from the active pursuit of the art; while Mr. Tunny was the first to demonstrate by his own practice that proto-sulphate of iron could be successfully employed instead of pyrogallic acid in the development of negatives.

For Contents, *see p.* 565.
For Index to Advertisers, *see p.* 583.
For Postal and Telegraphic Addresses, *see p.* 688.

ENLARGING PHOTOGRAPHS.

By The Editor.

Chapter I.—Prefatory.

Ten years have passed since the subject of enlarging photographs was editorially treated by the present writer in this Annual. Since that time it has entered upon phases altogether unimagined in those days. Prophesies then faintly hazarded as to its further spread and development have been more than fulfilled, until at the present time innumerable photographs are taken on a small scale with a primary view to future enlargement.

During the past decade printing on a scale of magnification has in a great measure been superseded by enlarging methods which involve the employment of ordinary daylight, or of artificial light conjoined with development; and hence in the following chapters this moribund system will be only lightly treated, and in connexion with the adaptation of the solar camera to modern and improved processes by which the same end is attained in a better, more desirable, and more durable manner.

Chapter II.—General Optical Principles Involved.

Enlargements cannot be practically produced without the aid of a lens to serve the part of an object glass, or objective, which latter term I will employ in this brief treatise in contradistinction to another lens of which I will have occasion to speak, and which from its function is named the condenser.

The sole object of a condenser is to gather all the rays of light which fall upon it and transmit them through the negative in the form of a cone whose apex shall be at the objective.

The function of the objective is to project an image of the negative at its anterior conjugate focus, the location of which, as will subsequently be shown, bears a strict relation to that of the negative, which has its place at the posterior conjugate focus of the objective. In short, the optical principle involved in enlarging is analogous to that by which an image of a minute body is enlarged by the microscope.

When the negative is sharp and possessed of the requisite gradation of tone, it is possible to enlarge it to the extent of three or four diameters, that is to say, from four inches to twelve, or sixteen inches, without its being readily discovered even by an expert that the resulting picture is an enlargement. A plea for the employment of small cameras may be deduced from this fact, and a further plea for securing the greatest sharpness possible in such small pictures.

Chapter III.—Solar Light for Enlarging.

By solar light I here mean the employment of the direct, unclouded rays of the sun transmitted to the sensitive surface without the interposition of any diaphanous sheet, such as ground-glass, or its being reflected from any white radiator, such as a sheet of card or enamel tablet.

This implies a slow method of printing and a large condenser—nine inches or upwards—for concentrating the light. I shall not here enter into the construction of a solar camera, beyond saying that the parallel rays of light which fall upon the large plano-convex condenser are transmitted through the negative, which must be placed in such a position in the cone of light as to receive all the light. The larger the negative is, the nearer must it be placed to the condenser, the great object being to have it in such a position in the cone as just to be illuminated to the corners, and not beyond them. It will thus be seen that the best position for a large negative is not that for one of lesser dimensions.

If then the objective be placed in the apex of the cone, the best condition for illumination will have been attained.

When the enlarged image is focussed on a sheet of ordinary albumenised silver paper it will print out just the same as if it were exposed in a printing frame under a negative, provided means are taken to ensure the solar rays falling upon the condenser in the same direction throughout the exposure. This will necessitate either the camera being rotated in its entirety by means of a pivoted stand so as to keep time with the apparent motion of the sun, or then that the rays be received from a mirror mounted equatorially for transmitting a motionless set of rays to the condenser. This motion can, and often has been effected by a careful attendant, but is much better accomplished by clockwork.

Concerning the printing, it need only be said that it is carried to the same extent as if done in a printing frame, the subsequent treatment of the prints being also similar.

The intensity of the light depends (*cæteris paribus*) upon the size of the condenser. Thus, if eight minutes be required to obtain a fully printed proof when employing a condenser nine inches in diameter, the time will be reduced to two minutes if, instead of the nine-inch condenser, one of eighteen inches diameter be adopted.

There is this inconvenience with a solar camera: the rays of the sun are brought to a focus at an invariable, definite distance from the condenser, hence, to secure the full advantages arising from having the negative in its best position in the cone of light, more than one objective must be relegated for employment with that camera; for as its position is prac-

tically fixed within narrow limits, and as the position of the negative is an unfixed one, an objective having a focus to suit the position of the negative must be selected.

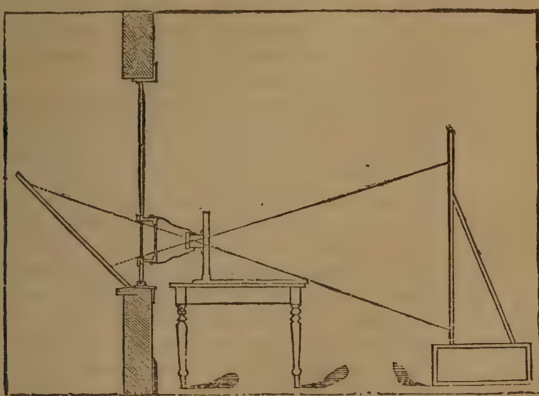
The printing processes to which the solar camera should be confined are the slower of those that are now recognised as permanent, such as carbon and platinotype. Enlargements on albumenised paper cannot be recommended on account of the too well ascertained tendencies of such prints to fade. For enlarging on bromide paper other means will be described.

But in a country like Great Britain, where a bright sun cannot be depended upon, an enlarging camera of the class here spoken of is not advised, seeing that everything capable of being done by its agency can be achieved by other means, alike less costly and less troublesome.

Chapter IV.—Enlarging by Ordinary Daylight.

To the professional photographer ordinary daylight forms the cheapest and far the most convenient method of making enlargements.

The best conditions of illumination are secured either by arranging the enlarging appliances in a slope, pointing upwards against an even sky, or, still more preferable, placing these appliances level on the floor or on a bench, and lighting the negative by means of a large, flat reflector placed outside of the window, and hinged at the bottom, so as to be raised or lowered to any convenient angle by means of a string at the top operated from the interior of the room in which the operations are conducted. This may be illustrated by a cut.



If the room itself is to be employed as the dark chamber or camera, it is absolutely necessary that no light be permitted to enter except that

which passes through the negative and the objective, to which end it is requisite that the whole window be obscured save one pane, and that in it be fitted a frame containing facilities for holding any negative of the dimensions most likely to be employed in enlarging. This is a condition the fulfilment of which is imperative.

The end of the objective or the frame to which it is screwed should also have fixed to it an opaque flexible cube or other convenient cover, such as a bellows body, the outer end of this being fixed to the frame in which the negative is held. This prevents the admission of light into the room.

The refinement of this system consists in having the negative frame operated in both a vertical and horizontal direction by means of rack and pinion or a quick-acting screw, similar to the mechanism employed in the movable stage of a microscope; although in the absence of this a sliding motion, similar to the rising front of the camera, in two directions, however, is necessary. I have a series of 12 × 10 wooden frames, in each of which is cut a recess beginning at quarter-plate size and passing upwards to 10 × 8. Any one of these is selected to suit the size of the negative that is to be enlarged; and the negative having been inserted and securely fastened by buttons, the frame is then placed *in situ* in the window recess, where it remains under such conditions as to render it quite easy to bring any part of the subject in the direct axis of the lens. One large frame, with a set of holders fitted in it, and retained by buttons, will, of course, serve this purpose equally well.

This negative frame may be so made as to form the back of a common deal camera composed of two boxes, one to slide within the other to permit of focussing, the lens being screwed to the end of the one inside. The outer, or negative end, must be pressed up against the window aperture to prevent admission of light around the margin.

The reflector which is placed outside of the window is permitted to drop down until it stands at such an angle as to form a luminous background to every part of the negative when viewed from the position of the lens. The balance of advantages will probably lie in having the reflector formed of glass silvered on the back, and when proper precautions are observed in framing this mirror it will not suffer harm from a shower of rain, nor need operations be suspended even when the weather is tempestuous. I have seen good reflectors formed of white enamelled iron plates, also of opal glass. These latter possess this advantage over the mirror, that they are altogether unaffected by variations in the luminousness of the sky; and whereas alternations of black and white cloud would by the mirror cause inequality of lighting in the enlargement, absolute uniformity would prevail with these under all circumstances. Even a sheet of white cardboard may be made to serve a useful part as a radiator of light.

Chapter V.—Enlarging by the Optical Lantern.

Of all methods of producing enlargements this will approve itself to the amateur who adopts this department of photography as a pleasant recreation in the evening, after the labours of the day are over.

The subject may be classified under the following heads, viz., the Light, the Body, the Condenser, and the Objective.

The Light.

This must be small in dimensions and intense in quality; the former in order to obtain sharpness, the latter to obviate the necessity of giving a protracted exposure.

Mineral Oil Lamps.—These, when well selected, are extremely convenient. It is probable that on account of its smallness an Argand flame possesses greater advantages than any other. It will undoubtedly serve the purpose equally as well as the limelight, provided a diaphragm be interposed, close to the flame, to cut off the top and bottom, as magnitude of the radiant in an optical lantern conduces to impaired definition. The theoretically perfect light is one in which dimensions scarcely find a place; but its attainment being impracticable, we must do the next best thing. Something much higher is aimed at in the optical requirements of enlarging than those which obtain when a luminous image is thrown upon a screen for the illustration of a lecture or the delectation of a lot of juveniles at an evening gathering. Parallax in the flame must be avoided, else will definition of a high class be sought for in vain.

The Marcy lamp is also a good one. By the Marcy lamp I mean all those in which the burner consists of more than one flat wick turned endwise to the condenser. Marcy, of Philadelphia, used two, others three, four, and five. The principle is the same, and I prefer giving the honour to the initiator. Space prevents me from mentioning the various names now given to this system of lighting according as it finds development in the lamps of the numerous manufacturers by whom it is issued. For projections it is powerful, and has superseded the Argand burner, but we have now to look at something else than mere power. The fact of the edges of the various flames which are contracted being axial in the optical system implies a fulfilment of the condition of sharpness in its highest form axially; but when oblique incidences are considered then are we met by magnitude of flame, and consequent parallax. Nevertheless, when the relative positions of the flames, each to the other, are such as to prevent vertical lines of varying luminousness being apparent in the centre, enlargements of fairly good sharpness and equal illumination throughout may be obtained by its agency.

Limelight.—One or other forms of the limelight may be employed with unvarying success. The blow-through jet is the safest and simplest when carburetted hydrogen or common house gas is used. Where this gas is not accessible then will the flame of a spirit lamp answer quite well. The blowpipe from the cylinder or bag of oxygen playing on this flame causes it to impinge upon a cylinder of lime, which, becoming incandescent under the great heat, emits a powerful light. The most intense form of this light is when the hydrogen and oxygen, both under high pressure, are brought into mixture just before they issue from the orifice of the burner. The light, when the gases are properly regulated, is not large, but exceedingly intense.

Welsbach.—The Welsbach lamp, in which a 'mantle' of cotton gauze, impregnated with a salt of zircon, is rendered incandescent by a small Bunsen flame playing against it from the inside, is at present yet only on its trial as a means of illuminating a negative for enlargement in the optical lantern. From such trials of it as I have made it appears to answer the purpose very well, although its intensity or penetrative force is inferior to some others, yet is this compensated to some extent by the remarkable whiteness of the light, by which the duration of the exposure is reduced.

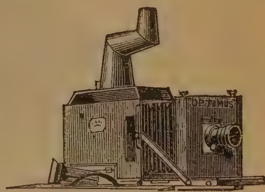
Albo-Carbon.—A flame of common gas enriched by 'albo-carbon,' or any other suitable hydro-carbon, has in my hands as well as in those of others proved to be a very suitable light for enlargements. Its best form is that which I introduced at the last Conference of the Camera Club, and consists of two fishtail burners, separated from each other by the extent of an inch, both flames having their flat sides towards the condenser, there being an opaque disc, with a circular aperture in it of a little over half an inch in diameter, placed as close as possible up against the foremost flame so as to reduce its effective area. The position of this aperture must be such as to be opposite to the most luminous part of the flame. The second flame behind the anterior one serves to confer intensity, and is of great utility; but nothing seems to be gained by a third burner. The gas flame when thus enriched by the vapours of the albo-carbon become very intense. An Argand flame from gas thus enriched ought to yield a light of great excellence, provided it has a smaller flame ascending through its centre, and that provision is made to condense it by diminishing its diameter either by a brass solar cap to cause a strong air current to impinge upon the flame a little above the burner, or by a contraction in the glass chimney. Whiteness and intensity in such a case are increased by a judicious lengthening of the chimney to increase the draught. The area of the flame must, however, be reduced by the expedient already pointed out.

Electric.—Much has been hoped for in electricity in the providing an incandescent or even a small arc lamp that would work with a primary

battery of moderate power; but up to the present time such has not yet been introduced.

THE BODY.

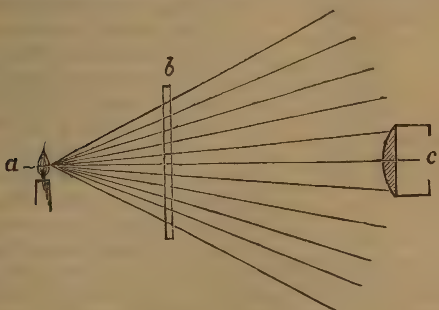
It need only be said relative to this that the strength of all the parts be such as to ensure the light, the condensers, the negative, and the object being held securely. Elegance must give way to strength. The covering of the lantern will be sufficient, no matter how or of what material constructed, if it prevents any leakage of light, for no light should be in the enlarging room during exposure but what passes through the lens on to the enlarging screen.



A good typical form of enlarging lantern is that shown in the cut. It partakes of the form of a camera in respect to its having a baseboard in front and a bellows body, the focal adjustment being by rack and pinion. The body may be constructed either of japanned tin or of wood having a metallic lining.

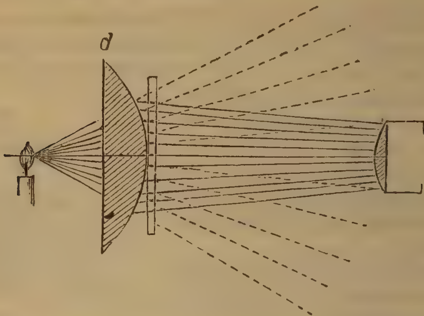
CHAPTER VI.—THE CONDENSER.

But what is the use of a condenser? an inexperienced reader may inquire. Its function is to gather together rays from the lamp which would otherwise be lost, and bend them in such a way as to pass through the negative and on towards the objective. Let *a* be the radiant, *b* the negative, and *c* the objective. Notice that while the rays are trans-



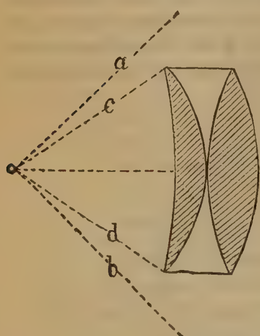
mitted through the negative only those that are nearly central or axial reach the objective. Observe now what takes place when a lens inter-

cepts the rays ere they reach the negative. They are refracted, and instead of getting lost as before (as shown by the diverging dotted lines), they have become deflected in the direction of the objective, and were the

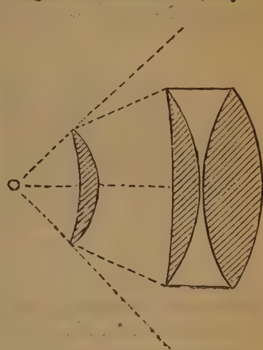


eye placed at the diaphragm of this objective it would see every part of the negative brightly illuminated. One condenser, however, does not answer properly on account of the spherical aberration that arises when the focus is short, as it must necessarily be.

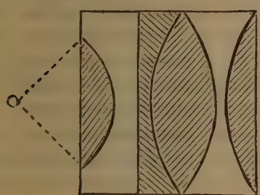
The condensers most commonly employed in optical lanterns consist of two plano-convex lenses mounted close together, the convex surfaces towards each other. This form answers fairly well when the flame is large, but, unless made with a long focus, it will not perform in a satisfactory manner when the flame or radiant is small. A better form, if only two lenses must be employed, is to have a plano-convex, or a lens of slightly meniscus form (this being according to the nature of the glass employed) working in conjunction with a biconvex lens. When the curvatures are such that the rays after transmission through the former of these fall upon the latter in a parallel direction, then must the curves of the latter not be of equal radius, but such as to make it a ' crossed lens,' in which the radii are as one to six, or nearly so, this being well known to be a form that is fairly conducive to the reduction of spherical aberration. But even here, unless the focus of this combination be long, perfection of illumination is unattainable. Why, then, not make it long? For this reason, that the loss of light would be too serious. It is of primary importance that the light in a



lantern, whether for projecting a picture for examination or for enlarging, be powerful. How is this to be done? I answer it by requesting attention to the diagram at the bottom of preceding page, in which, although the lenses are not so correctly figured as they ought to be, the principle is plainly enough shown. In this diagram an angle of illumination, say of ninety degrees, might be obtained, but the condensers are unable to grasp more than *c* and *d*, a large volume from *a* to *c* and from *b* to *d* being left outstanding. Now when it is considered that this represents a loss of about one-half of the light, its reclamation is evidently worthy of attempting. By intercepting these lost rays by a plano-convex or a meniscus lens, which need not be of so great a diameter as the others, as shown in the diagram on the right, it will be seen that they are by it secured and made to impinge upon the condensers. The deduction from this is that a triple condenser is better than a double one.

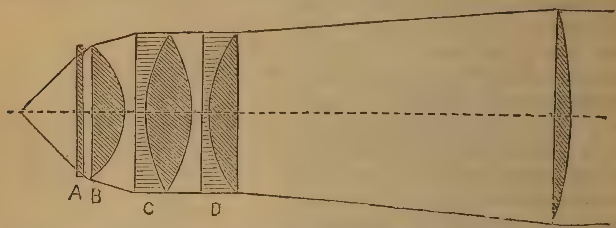


Although, when writing on this topic ten years ago, I introduced the details of several high-class condensers of three or more elements devised by recognised authorities, I see no harm in recapitulating, especially as I shall from such course be able to indicate a point of great utility to enlargers at the present time. Passing by one I devised many years ago, composed of three plano-convex lenses, the centre one of which was achromatised, and that farthest from the light of colourless crown of a high refractive index, shown on the left, I come to the condenser of the late Thomas Grubb, F.R.S., figured on the next page, in which A is a piece of plain glass, to act as a protection to the condensers; B is a plano-convex simple lens; C a plano-convex achromatised; and D a combination very much over-corrected for colour, and of slight negative power, although the externals are plane. From C to D the rays are nearly parallel. Passing through D, they diverge until they are received by a large lens by which they are rendered convergent.



An excellent condenser was introduced by Dr. Henry Morton, of Hoboken, which includes a large angle of light, and need not be very expensive, even if constructed of colourless glass. All the lenses are single, and of plano-convex form. The lens next the light is four and a

half inches in diameter, the radius of curvature being the same; the second lens has a diameter of five inches, and a radius of three and a half inches. These two have their flat surfaces towards the light. The diameter of the third is five inches, its radius being four inches. The two first lenses have their plane surfaces towards the light and are permanently attached to the lantern ; the third has its curved side to the



light and so attached as to be easily removed. The two first lenses, when used alone, give nearly parallel rays, while the third serves to converge to a focus at eight or nine inches in front.

Selecting from such lenses as I had beside me, I made a condenser on the model just indicated, but with this modification (adopted perforce to suit the exigences of the case), that the removable lens was of the crossed form, the most convex side being next the light, and it was six inches in diameter. This was placed at some little distance from the second lens, from which by adjusting the light the rays emanated in a divergent form so as to utilise the whole diameter of the biconvex lens in receiving them. It scarcely needs saying that a larger negative could have been embraced by the modification introduced than if the last lens had been five inches in diameter. Let the collective element in a condenser be as perfect as possible in its twofold capacity of securing a large angle of light and transmitting it to the condensing element in a perfect manner, then wherever this condensing lens be placed, or whatever be its diameter—which may be such as to admit of a half or even a whole-plate negative—one has the satisfaction of knowing that the most has been made of the light that is possible. Two plano-convex lenses, flat sides towards the radiant to collect the light, and a third lens, or set of lenses, of larger and varying dimensions to suit the size of the negative, will form a condenser that will meet every case, and is to be recommended as the best type of practicability.

One word more anent condensers. See that all the lenses are made of glass as free from colour as possible; and especially in that next the negative see that it is free from such defects as air-bubbles and striæ, as when near the negative these tell unpleasantly.

Chapter VII.—The Lenses for Enlarging.

If the subject to be enlarged is a single portrait, say of *carte* size, or a little larger, then will a *carte* or other good quarter-plate portrait lens be found to be the most suitable. It is of the greatest consequence, however, that the back lens of the combination be placed next to the negative, otherwise will the definition and flatness of field be inferior. There will be little or no necessity for using a diaphragm in the lens, as the area of sharpness when employing full aperture will be quite sufficient for the intended purpose.

But in the case of a landscape or a group, some members of which are near to the margin of the plate, it will be requisite either to make use of a diaphragm, so as to ensure marginal definition of the highest class, or to employ a lens of longer focus. The solar focus of a lens is not its focus when used for enlarging, more especially to the extent of only a few diameters, and hence it should be borne in mind that the focus being longer when thus employed its covering power is extended. A combination lens of the 'rapid' doublet type will be found excellent in the case of a landscape, in which, unlike a portrait, the marginal definition must equal that of the centre.

If time of exposure be of no consequence, then will a single achromatic of plano-convex or meniscus form answer well the purpose of an enlarging lens. But it is necessary that a rather small stop be employed, that it be situated at not less, but preferably more, than the diameter of the lens from its flat surface, and that the convex surface of the lens be placed next to the negative. There will be a residuum of distortion when employing such a lens, but in the case of a landscape or group it will not be discoverable in the large picture which results from the operation, and this being so, nice theoretical considerations concerning rectilinearity may be placed to one side. But if any curvature of a marginal vertical straight line—as in the case of a building—be discoverable, this may be reduced by removing the diaphragm and placing it closer to the lens. This applies only to single landscape lenses, and only then if the subject be an architectural one, the vertical lines of which extend to the margin and show indications of being curved.

In an objective employed in enlarging one is apt to be deceived as to its focus. This may be illustrated by an example. Suppose that the solar focus (equivalent) of the enlarging objective be six inches, the distance between the centre of the lens and the negative to be enlarged would be six inches practically, were the screen on which the enlargement is projected at an infinite distance. These two, the negative and the screen, represent the anterior and posterior conjugate foci of the lens. But as such a position of the screen is impracticable it must be brought nearer, and as there is a strict relationship between the conjugate foci,

the nearer the screen is made to approach the objective the farther must the negative be removed from it. When the screen has been brought so near as to show the image of the same dimensions as the negative, then if a careful measurement be made, it will be found that the lens has now a focus of twelve inches, or double that it possesses for distant objects. The anterior focus of the lens, represented by its distance from the screen, is now found to have been reduced from infinity to also twelve inches. From this we learn that every lens possesses two foci.

In giving directions by which the position of both object and image can be determined when the focus of the objective is known, I cannot do better than repeat a formula I gave eighteen years ago relative to this, premising that in making an enlargement one should know how much he intends to enlarge his negative or the proportion which the linear dimensions of the image bears to those of the object, for the length of one conjugate focus to the other is exactly proportional to the height or length of the image to that of the object. This being important to know in all operations of copying, enlarging, or reducing, I give the formulæ which furnish a reply to the following questions:—

Desiring to enlarge or reduce a picture (n) diameters with a lens of which the equivalent focus is (f), where shall we place the negative and focussing screen respectively to have the best definition, measuring from the centre of the lens?

Calling one focus (u) and the other (v) the answer is:—

No. 1.

$$u = (n + 1) f,$$

and

No. 2.

$$v = f + \frac{f}{n}$$

The first formula simply expressed is:—Add No. 1 to the times of enlargement, and multiply the sum by the equivalent focus of the lens. The product is the length sought for. No. 2. To find the other focus: Divide the equivalent focal length of the lens by the times of enlargement or reduction required, and add it to the equivalent focal length. The sum is the length sought for. The relative place of the object and image will depend upon whether we have to enlarge or reduce our negative. If the former, which is the object sought to be attained in these chapters, then is u the position of the image; if the latter, it is that of the object, and so with the other focus.

Chapter VIII.—The Employment of Large Flames in Enlarging.

There are several lamps which give a large, pure, and powerful flame, and the question for consideration is, How can these be utilised in the production of enlargements?

In our fourth chapter I have spoken of enlarging by means of light

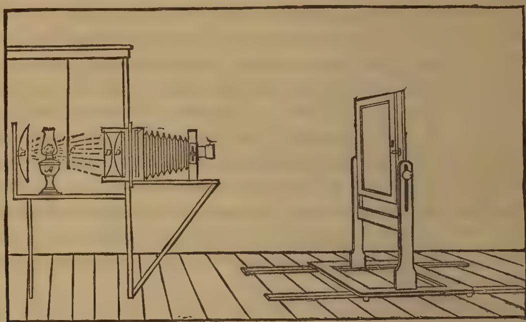
radiated from a white surface. The means now to be described are similar to this in principle, but are carried into effect in a different manner. The source of illumination is in this case a large body of flame. It may be composed of a sun burner, a flame from a regenerative gas burner of the Wenham class, or from several gas lights or oil lamps placed closely together. In the case of such burners as depend from above and throw their light downwards, the direction of the illumination must be rendered horizontal by placing a mirror close to the flame at an angle of forty-five degrees, and this must fall upon a sheet of diaphanous material, which will then serve as a bright backing to any negative placed in front of it, the light being, of course, behind. A plate of ground-glass is a convenient radiator for this purpose, but it is far from being the best. To prove this, hold up a sheet of such glass in front of a flame and look at it. It will be found that almost only in a line with the eye and the light does the ground-glass appear luminous; in proportion as the distance from this line of interception increases so does the luminousness decrease. Were a second sheet of ground-glass interposed this inequality would be lessened but not cured.

I have seen flashed opal glass which, if it did not transmit so much light centrally as does the ground-glass, yet is nearly of equal luminosity throughout, and therefore better adapted for the purpose now aimed at. Indeed, I venture to say that if it be carefully selected, the very perfection of a distributing plate for light is to be found in flashed opal, especially if ground on the flashed side. No matter how the light falls upon it there is presented to the eye on the opposite side an even, unbroken uniformity in illumination. Pot opal glass will not answer, at least none that I have examined. The next best thing to flashed opal is to coat glass with an emulsion of carbonate of lead in plain collodion or gelatine. The lead must be carefully sifted before being added to the collodion, and the whole then shaken up together. If this be applied upon ground-glass so much the better. Having such a radiating plate, the negative is placed in front, and one or more lamps or gas flames behind. To utilise all the light a common spherical reflector should be placed behind each flame. The enlarging objective being directed to the negative thus illuminated, an even and beautiful enlarged image will be found projected on the focussing screen.

If ground-glass with only one or two central lights *must* be employed, then ought a large lens, one somewhat larger than the negative, be interposed between the negative and the ground-glass so as to converge the otherwise divergent rays towards the objective. A powerful biconvex lens of the class used for graphoscopes or any other sort of 'peep-show' will answer this purpose quite well.

Chapter IX.—The Easel.

Where enlarging is to be carried out on an extensive scale a pair of rails should be laid upon the floor and the easel constructed so as to travel easily backwards and forwards on them, as shown in the adjoining diagram. This preserves parallelism. The easel must, of course, be



faced with fine white paper or card, and when the light is powerful a good degree of sharpness is obtained in focussing. With such a light and a lens working with full aperture, the focus may be easily secured; but very different will be the case when, in order to obtain marginal sharpness of the highest class, the lens may have to be diaphragmed down to $\frac{f}{30}$ or $\frac{f}{40}$ or even to a still greater extent. In such a case another system must be adopted—one in which a ground-glass screen for focussing, and a white board for roughly approximating the size of the image and its proper location on the sensitive sheet, are interchangeable.

This can be attained in a simple way by having an aperture in the centre of the easel, in which is fitted a square of ground-glass, the grey surface of which must coincide with that of the sensitive paper. Rough focussing and adjustment having been effected by reflected light on a sheet of card, on which is marked the dimensions of the enlargement desired, this is then removed and accurate focussing effected by the ground-glass.

One of the most generally useful enlargement easels I have seen is that which is, or at any rate *was* when I saw it, employed in the rooms of the Society of New York Amateurs, and which was, if I recollect aright, devised by Mr. F. C. Beach, at that time President. The focussing frame, which is of an oblong form twice the size of the paper to be employed, is pivoted in the centre like a bedroom looking-glass, and permits of either one end or the other being turned up to receive the enlarged image. This frame is divided in two portions: *on* one a sheet of white paper is pasted,

and *in* the other a sheet of ground-glass is inserted; both coincide when turned up to the right angle. First rotate this frame, so as to place the ground-glass to the lower side below the level of the baseboard, the plain end now facing the lens. On this the adjustments are made, and the sensitive sheet pinned thereon, by yellow light, of course. The ground-glass end is then turned up, and the focus being carefully adjusted, it is turned down again, the sensitive sheet thus taking its place. The exposure is then made, absolute sharpness being the result.

If, instead of sensitive paper, a sensitised sheet of glass be employed on which to enlarge, the thickness of the glass extra must be taken into account.

A lens-cap, having in it a small pane of ruby or orange glass, will prove useful in adjusting a sensitive sheet of paper on the easel.

Chapter X.—How to Compute a Table of Enlargements.

Although in the end of this annual there is a useful table of enlargements which answers nearly every case, yet, as it is not impossible that special instances may occur in which neither the degree of amplification nor the focus of the lens are to be found in that table, I think it desirable to give here specific and simple directions founded on the rule in Chapter V., by which any one who desires it may frame a table of enlargements based on any unit of measurement he prefers. As will be seen, it is in some sense a repetition of what has already been said.

In one vertical column place, either in English inches, French lignes, centimetres, or any other unit of measurement desired, a list of the foci of all the lenses likely to be required, and along the top, at a right angle to the focus column, place a row of figures expressive of the times of enlargement desired, separating one from the other by a vertical line. To fill in the figures in these vacant columns, commencing at the first one, add one to the number written at the top, and multiply it by the focus of the lens; the product is the distance at which the sensitive paper must be placed from the lens, measuring from the centre of the combination, or, more accurately, from the Gauss spot, a point near to the centre, and which in this case is a trifle nearer the front lens than the position of the stop. To ascertain the distance at which the negative is placed from a similar point in the lens (and which is now a little nearer the back lens than the optical centre) divide the product in the above computation (the distance between the lens and the sensitive sheet) by the number of times of enlargement; the quotient gives the distance required. Then insert these two measurements one over the other (the larger uppermost) in the space opposite the focus column and under the enlargement times of enlargement column. Thus at a glance will be found all the dimensions required in the enlarging of any picture. If with one lens the dis-

tances be found to be inconveniently long, an objective of shorter focus may be selected. To determine the total distance, that is, the distance between the negative and the sensitive sheet, it is only necessary to add together the two products of the former calculation, and the sum is the length required.

The table in this ALMANAC, owing to the width of the page, extends only to an enlargement of eight times, linear measurement; but from what has been here said, no difficulty will he experienced in carrying out the figures of amplification to an unlimited extent.

CHAPTER XI.—THE PROCESS.

This is perhaps the most difficult matter of all to treat of in connexion with enlargements. And yet why should it be so? Enlargements are now made for the most part on bromide of silver paper, which is easily procurable in commerce; and so far as this is concerned, it merely suffices that a sheet of such paper shall be exposed for the proper time, which the clever operator shall have determined beforehand by sacrificing a small sheet. Ferrous oxalate is the most suitable developer for such paper.

If an enlarged negative be wanted, a transparency must first be made by contact with the negative or in the camera. This can then be enlarged, and the resulting enlarged negative be utilised in the production of carbon or platinum prints in the printing frame. For such prints this will be found a more convenient system than by direct enlarging at one operation.

For the cheaper class of club pictures the collodion transfer process —a wet collodion plate from which, after development and fixing the film is removed by transferring to a sheet of paper sized with gelatine— may be employed at a minimum of cost; and so also may be the photo-mezzotint picture, which consists of a large glass vignetted transparency, backed with a sheet of drawing paper on which certain lines or hatchings are made, which serve as a sort of crayon *entourage* for the lower portion of the picture.

It may here be said that in the absence of a properly constructed easel for employment with the optical lantern, a passable substitute may be made by suspending a flat board by two rings on the wall, and having affixed the sensitive paper to it by drawing pins place the lantern on a table in front. The focussing must, of course, be adjusted previous to affixing the sensitive paper. By having two movable studs at the bottom, glass plates can be operated on equally well.

For CONTENTS, *see p.* 565.
For INDEX TO ADVERTISERS, *see p.* 583.
For POSTAL AND TELEGRAPHIC ADDRESSES, *see p.* 688.

GLASS PHOTOGRAPHS *VERSUS* TIME.

By C. Piazzi Smyth (Astronomer Royal for Scotland).

'*Versus* Effects *with* Time,' might perhaps have been a better title, for, though the old Roman denounced '*Tempus edax rerum*' ('Time the devourer of all things'), time itself is surely innocent enough; for what is it but a quiet, unostentatious, yet sublime unrolling of the material of eternity, each part of it in succession inevitably here to-day and as necessarily gone to-morrow, and how or where who can tell? But what other things, and often very mischievous little matters too, may not have been at work on our art treasures during any given interval! 'Ay, there's the rub!' for if said art treasures be positive photographs on glass—transparencies, as I believe they are called in one word—then, though they be beyond expression beautiful when gazed at by transmitted light, and though they be coated with polished plate glass on either side, and seem, when at their best, like reproductions in miniature of Nature herself in some adamantine material that gives them promise of lasting for ever, yet are they, alas! only too amenable to a variety of injuries, diseases, and decays, arising often from very small causes indeed, and some of them certainly preventable.

Now within the last few days I had occasion to overhaul something like a score of well-filled grooved boxes containing exactly such glass positive photographs. They had been prepared from negatives made twenty-nine and thirty-one years ago, had been abundantly exhibited to both friends and the public by stereoscope and oxyhydrogen lantern during the first twelve years of their existence, but during the last seventeen had been simply stored away in bookcases, where they had been thought of no more than if they had been old ponderous tomes in a hereditary family library, growing older and browner year by year.

The photographic method of most of these pictures was wet collodion, varnished when dry, and then covered by a clean glass plate with an edging of gummed paper all round to hold the glasses together and keep the dust out. They had all been taken from the negatives, not by superposition, but by a copying camera, first of the same size as the negatives, while afterwards artistical bits were selected and magnified, according to their sizes, variously from two to seventeen times linear, so as to illustrate special detail such as only a photograph can worthily give. And although the size of plate for almost all these magnifications was the 6·75 inches long by 3·25 inches high of the orthodox stereograph, yet there were examples of magnifying on larger plates, up to 8×10, while various methods of moist collodion, dry collodion, simple albumen, and collodio-albumen, had their representatives amongst the collection.

Who but one who has worked long upon glass and secured, both in his negatives and all the magnified positive copies he has made from them, more or less of the microscopically fine definition and exquisite shading which photography on glass is capable of, knows the ineffable pleasure of looking over his own transparencies of important occasions in life some thirty years ago? How instantly and sweetly is memory revived! We stand again amid the scenes of our youth; and to me, after having well dusted and cleaned the old stained and battered boxes, shut out side light, and arranged a table at a convenient height before a window looking to the sky, what a full three hours of enjoyment and

instruction, too, did there not come as I drew up out of its grooves and poised one plate after another between my eyes and the light, renewing acquaintance thereby with the realities of place and time now long passed away.

I could hardly decide which to admire most, diverse as they were, either the instantaneous views taken with wide aperture or the infinities of refinement secured with very small stops and long exposures. There, however, looking perfectly life-like and wanting no colour to speak to its nature and truth, was the surf of the ocean breaking with long white surges on the rocky shore of Teneriffe; how often, too, have they not similarly broken there since then, unseen by me and unpictured by any one! And there also, in the mimic world on glass, stood the great central cone of the volcano, seamed down its sides with a thousand streams of black lava, the last one even ages upon ages old. There, too, on another series of the plates, were the great government offices of St. Petersburg; and there also the gold and silver domes and glittering crosses of the cathedrals of Moscow and the Tartaresque towers of the Kremlin. There, also—but I beg the reader's pardon for going on so far and so long in this style, for it was not to describe the inherent beauties of any transparencies that I sat myself down to write on this occasion, but rather to tell him plainly and practically of anything that I might possibly have found during the examination of so many and so old glass photographs marring their beauty, impeding their usefulness, and threatening to curtail their existence among men.

Now, in this point of view, the evil which caused me the worst twinges of conscience was, that in certain of the subjects a sickly, brown, opaque hue had grown over nearly half the plate. This, too, was easily traced up to their having been fixed with *cyanide of potassium*, so strongly recommended at the time because 'so clean, so quick, and requiring so little washing;' yet this has been the result. Earlier pictures fixed by hyposulphite of soda were as transparent as on the day of their birth, or, rather, their washing. An eminent *savant* in America, the journals say, has recently been holding forth at the Photographic Convention of Chicago on his 'Search for a Substitute for Hyposulphite of Soda,' but quite needlessly where *glass* pictures are concerned. Wherefore let us rather rest and be thankful for the potent salt which Sir John Herschel discovered when the nineteenth century was young, and held ready at hand to bring out as a *complete* solvent of chloride, iodide, and bromide of silver, the moment that photography should be invented; and he did bring it out accordingly in 1838.

Again, not a few of the transparencies required to have misty spots of moisture and dust rubbed off the outsides of the glasses, but a vastly greater number had to be cut open to allow of the far more abundant moisture *inside*, or *between* the two glasses, being rubbed off. How it had got in there, and why, was a puzzle; but, fortunately, its predilection was always for the plain glass, not the pictured surface. On the said plain glass's inside surface the depositions were at first in microscopic globules, but as the disease progressed the globules became drops of water of such a size that they were forced into mechanical contact with the pictured film, and after keeping that sodden for perhaps several years, the varnished collodion had given way in the shape of long sinuous cracks extending all over the surface, though albumen and even collodio-albumen had successfully resisted.

But what strange surprises do not take place in the world even still! For actually after this paper had been begun, there have just been returned to me from India two boxes of stereo-sized transparencies of the Great Pyramid, which I had made over to a friend no less than nineteen years ago in order that he might exhibit them in Bengal by oxyhydrogen light, discourse for a season or two on the sacred and scientific theory of that wondrous monument, and then hand them on to an educated Christian Hindoo for further exhibitions; so that I had long since given up all idea of ever seeing them again. Yet here they have arrived at the very point of opportunity to assist in settling the question of time, or effects *with* time, *versus* glass photography.

It will probably be allowed that the distances they have travelled, and the time they have been knocking about the world, makes their testimony valuable; and when I further state that the material of all the pictures was wet collodion varnished, and that every one of them was found on opening the boxes perfect, with no discolouration and no moisture, the question may be asked how that came about.

First of all, then, I would answer that they were all fixed with hyposulphite of soda; and, second, they had no covering glasses. So dexterously, too, had they in that naked sort of condition been passed through the lantern, that only one of the pictures had received a visible scratch. Further, they were fitted in grooves endways in the boxes, which were of plain deal, without any *glued on* cloth, and the glasses were consequently standing with their longer edges on soft wood, while the lids came down on their tops without leaving any sensible shake. Perhaps, too, I should add, that at the time of taking these transparencies from the original negatives I had begun to be suspicious of all plates of very *white* glass being more or less hygroscopic, and therefore chose greenish glass as being both harder and remaining for a longer time in damp situations without becoming misty from moisture.

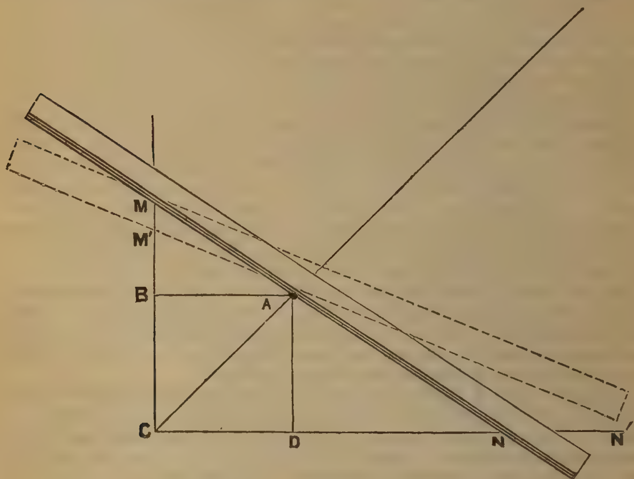
And how glad I should be if all our opticians were equally on the watch to detect hygroscopic tendencies in the glass they employ for lenses! I have a large portrait combination of admirable mechanical and optical construction, giving a flat field with full aperture and faultless definition, but with such a tendency to attract moisture, to its *inside* surfaces chiefly, as to require to be opened and cleaned out every few days, or nothing in the way of instantaneous photography could be performed with it. This is an evil, too, under the sun, rather increasing than diminishing with the new kinds of very refractive glass now being made, and is usually very difficult to detect in an instant if the glass has just been cleaned. The astronomers in an observatory not a hundred miles from London are just now having a twenty-eight-inch objective made for their largest equatorial, and are in raptures at their prospects. But suppose the glass of one of its lenses turns out to be hygroscopic, and requires its acquired and growing moisture to be cleaned off from its inside surface at very frequently recurring intervals, just figure to yourself their consternation and agonies and loss of time in the future.

Pray, Mr. Editor, how do you—whose knowledge of lenses is wide and deep, and extends with such fervent devotion for the art-science over more than a quarter of a century—how do you guard yourself against being entrapped into taking a lens which in a few days shall prove itself to be a hygroscopic collector of watery vapour?

A SIMPLE METHOD OF ESTIMATING THE VARIOUS CONJUGATE FOCI OF LENSES.

By Sir HOWARD GRUBB, F.R.S.

THERE are not a few photographers who dislike anything of the nature of mathematics, and who when told that a formula such as $\frac{1}{f}+\frac{1}{f^1}=\frac{1}{F}$ gives them all information with respect to conjugate foci, &c., shrug their shoulders and say they would prefer to work it out experimentally. To such, the following graphical method of arriving at the various conjugate foci of any lens may be of use :—



Draw on a board, wall, or floor a square, A B C D, each side of which is equal to the focus of the lens, produce two adjacent sides of the square C B and C D. At A insert a pin or nail. Now place a rule or a straight-edge against A, and rocking it in the pin or nail there inserted observe where it cuts the prolonged sides of square as at M and N or M^1 and N^1.

No matter what position you place the rule in (always provided it rests against the pin at A and cuts the prolonged sides of square) the distances C M and C N will represent a pair of conjugates for that *particular* lens. If it be required to enlarge or diminish by four or six, or any definite number of times, it is only necessary to rock the rule on pin till one of the distances C M is four or six times more or less than the other C N.

In other words, any lens of a focus equal to C B will form an image of an object placed at a distance of C N at the points C M, &c.

Similarly if the focus of the lens be not known, but that the distance is known at which an image is formed behind lens of any object at a

known distance in front of same, and that it is desired to know the focus of that lens. Measure off the distance of the object from lens on a horizontal line as at C N, and the distance of image from lens on a vertical line as at C M, lay straightedge across them and observe where this cuts the diagonal lines as at A, then draw A B parallel to horizontal lines, and C B or A B is the solar focus of lens.

The above, which may prove useful to any one engaged in enlarging operations, depends upon the fact that in the figure given—

$$\frac{1}{CM} + \frac{1}{CN} = \frac{1}{CB} \text{ or } CB = \frac{CM \times CN}{CM + CN}$$

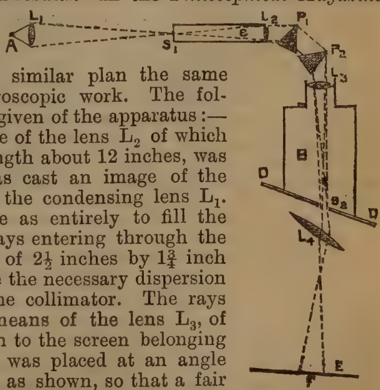
Now as this addition and subtraction of reciprocals enters very largely into many optical calculations, it will be seen that the above is only one of many cases in which this graphical method may be utilised.

I have lately constructed a machine for calculating all the ordinary optical formulæ on this principle. With this machine, which is of very simple construction, a workman without any knowledge whatever of mathematics can calculate in a few minutes the focus of a lens, knowing its curves and refractive index, or *vice versâ*, and can by a little addition to the machine estimate also its longitudinal spherical aberration.

MONOCHROMATIC ILLUMINATION OF MICROSCOPIC OBJECTS.

By Captain Abney, R.E., F.R.S.

There is often a difficulty felt by those who use the microscope for photography as to the proper focus to employ. The optical focus is not incident with the focus of those rays which are most powerfully photographic, and to obtain the most perfect results resort is usually made to the system of trial and error. I wish to point out how this may be avoided and with very good results. In the *Philosophical Magazine* for August, 1885, I gave a plan for obtaining patches of monochromatic light on a screen, and by adopting a somewhat similar plan the same means may be used for microscopic work. The following is the description there given of the apparatus:—



A collimator C, the aperture of the lens L_2 of which was $1\frac{1}{2}$ inch, and the focal length about 12 inches, was employed. On the slit S_1 was cast an image of the source of light A by means of the condensing lens L_1. This was of such an aperture as entirely to fill the collimating lens L_2 with the rays entering through the slit. Two prisms, P_1 and P_2, of $2\frac{1}{2}$ inches by $1\frac{3}{4}$ inch side, and of angles of 62°, gave the necessary dispersion to the parallel beam, from the collimator. The rays were brought to a focus by means of the lens L_3, of about 14 inches focal length, on to the screen belonging to a camera, B. This screen was placed at an angle with the axis of the lens L_3 as shown, so that a fair focus of every visible ray was obtained upon it. (It may be worth mentioning that a hair placed across the slit or a little

particle of dust is a good means of obtaining a focus when Fraunhofer or bright lines are not observable. The black streak produced by it should be sharp along the whole of the spectrum.) A card, D D, with a slit S_2 or slits cut in it, replaced the ordinary dark slide, and, by moving it along the spectrum, any colour or colours can be allowed to pass. Before using the apparatus the whole of the spectrum was caused to fall on a convex lens, L_4, of about 24 inches focal length and about 5 inches diameter. This collected the dispersed beam of light, giving an enlarged image, F, of one surface of one of the prisms on a screen, E. By placing this lens at an angle with the axis of the lens L_3, the blue and red fringes can be made to disappear almost entirely, and a practically white patch of light is seen on the screen E. I may say that the lenses used are white flint of medium density and almost colourless, even in great thickness. When the adjustments are complete, as the slit is moved along the spectrum every patch of colour or colours will successively occupy the same position on the screen and have the same area very nearly. We thus can have patches of monochromatic light of any colour or combinations of any colours, all other colour being absent.

Now instead of using apparatus of this size for microscopic work, the dimensions may be considerably reduced. C may be 4 to 6 inches in length, and the diameter of the lens L_2 be only $\frac{1}{2}$ to $\frac{3}{4}$ inch. L_3 may be reduced to a focus of 6 inches, and L_4 also to the same or less. With this modified apparatus a very brilliant spectrum will be thrown on the focussing screen D. The slit S_2 in D may be so wide as to include the brightest part of the violet and a portion of the blue, and the slit S_1 may be opened to $\frac{1}{20}$ of an inch. The lens L_4 will then throw a blue image on the screen E, or this screen may be replaced by the object on the stage of the microscope. The image can then be focussed with the light which is most photographically active, and the image on the plate will be of the same sharpness as the image seen in the microscope. As for the source of light at A, it may be an arc light, an incandescence light, or lamp-light, or A may be abolished and sunlight be used. It should be noted that L_4 need not be a large lens, since it is only necessary where S_2 is unmoved for it to receive the rays of a small part of the spectrum. A series of spectacle lenses of varying foci is a useful adjunct to have, so that the colour patch produced may be as small as consistent with covering the object to be photographed.

Sometimes 'ghosts' are said to be troublesome, but these may be got rid of by the use of a second prism behind S_2, which effectually disperses them.

SMALL *VERSUS* LARGE NEGATIVES FOR PHOTO-MICROGRAPHS.

By R. L. Maddox, M.D., Hon. F.R.M.S., &c.

The following question has often been referred to me, Whether it is best to make large photo-micrographs direct, that is at one proceeding, or to enlarge to the same magnification from small negatives? Some may think this a needless question, but when you come to explicit statements and matters of detail, then the question is often met by the equally simple answer, 'I don't know.' Photo-micrography each passing year

seems to be obtaining increasing favour with microscopists, and to those who, like myself, have been conversant with the subject of photomicrography for more than a quarter of a century, and have watched the slow but gradual progress it has made in this country, and the advantages derived from the use of the immersion lenses, I fear the question must receive a rather guarded answer.

The advance in photographing the most minute entities in nature has depended largely on the extended perfection and optical excellence of the objectives with the advantages derived from the use of the gelatino-bromide dry plate, and the substitution of artificial illumination for sunlight. To the writer it has appeared an almost impossibility to lay down any hard-and-fast rules in answering the question, but there are a few points which may be stated as derived from experience without being dogmatic, viz., that when using low or medium powers on such objects as insects, or parts of insects, or those which form the general run of lantern slides, or on histological or pathological sections, where the gradations and different refractive power of the various component parts differ sufficiently, and considerable penetrating power of the objective is needed to cover the different planes, and always presuming it is not intended to carry the magnification to extremes, or beyond the ordinary use of the quarter or even half-plate, then the magnification may be direct. The result by the one operation will then equal, if it do not surpass, an equal enlargement by other means, or a reduction from an extreme primary enlargement.

On the contrary, when the enlargement is to be extreme, as in the case of the beautiful examples of Mr. Vile's and Mr. Swift's proboscis of the blowfly, then it has appeared by the results that it is best to enlarge from the most perfect small negative that can be made. When the question refers to diatoms with very delicate markings such as *Navic Rhomboides* or *Amphipleura pellucida*, and which lie pretty well in one plane as the nearly flat ones, but need large (N. A.) numerical aperture to resolve them, then it has appeared to the writer to be best to make a *moderately* small negative, which yet by the help of an ordinary magnifying lens shows the markings perfectly, and to enlarge from it for the following reasons:—The perfection of the focussing is likely to be more assured; the objective used more nearly at its point of opticians' excellence; the time of exposure shortened, and thus less chance of accidental alteration of focus, as by the heat from the lamp, as was pointed out some years since by the writer as a point to be attended to; and, lastly, the risk of tremor from any cause diminished; at the same time, should there be failure, then the cost is much lessened, and if more than one object presents itself in the negative, the best one can be selected for the next process. When we come to photographing the very minute objects by the use of the really high powers, as in photographing the bacteria, then as far as I am able to judge after some experience, it seems better photographs are to be made from the enlargements of perfect small ones than by magnification to the same size at one operation. It is at this point a difficulty presents itself, assuming the apparatus and operation to be at their best, which the perfection of the plate must largely decide. The writer would cede rapidity in favour of the slower plate, provided the perfection of the film or its coarse granularity offer any choice. At this point the memory falls back on

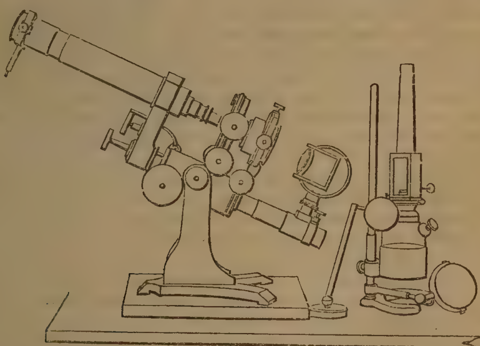
the beauty of the collodion film for the primary negative. For many years I confess I had no very decided opinion on the primary question, but after seeing the delicate little negatives that were exhibited at the Exhibition in 1884 at M. Pasteur's table, by my friend Dr. Roux, one of M. Pasteur's assistants, and the enlargements from them, I have never lost sight of the possibilities from small negatives; and judging from some of my own production, though considerably exceeding in diameter the plates that Dr. Roux employed, I have not found any reason for neglecting the value of these minute negatives. We all remember the perfection attained by Professor Piazzi Smith in his very small photographs of various parts of the Great Pyramid, which he obtained on the collodion plate while in the bath, the rays through the objective being brought optically and actinically to one plane by the addition of a plano-concave. These different methods pointed to advantages not to be ignored, though against them has to be set the trouble of the double operation of the enlargement, and such must be duly balanced by the operator.

For the busy microscopist my own opinion leans to the small negative as having many advantages that can't well be neglected, especially as there are now such ready means to enlarge direct on to gelatino-bromide paper, which can be easily managed at home. If the time do not permit of the different stages for the production of a positive about half-way towards the full magnification desired for the enlarged negative for contact printing, the small plates can be placed in the hands of those who undertake such work.

The foregoing remarks apply more particularly to the use of the old form of objective, but whether the new form—the 'apochromatic objectives' and their accompanying 'projection eye-pieces'—will admit of enlargement direct equal to or superior to the method advocated, is at present a question *sub judice*. The great flatness of field, their excellent defining power, their long focussing distance, are all qualities with the increased N. A. in their favour, against which, unfortunately, their costliness forbids their common use.

There are various plans for taking small photo-micrographs, but only one will be dealt with here, and which supposes the operator to be both microscopist and photographer, the ordinary microscope being in use. The figure—which explains itself—is more particularly as seen arranged for use with sunlight, an Abraham's achromatic prism on the tail-bar of the microscope taking the place of the ordinary mirror or heliostat, and to be used with the ammonio-sulphate of copper cell or *cobalt* glass, and possibly the grey diffusing glass, or the prism can be directed to the source of artificial light to take the place of the bull's-eye. The prism can be removed or turned down out of the way when the microscope stands inclined, as in the figure, and the substage condenser directed to the source of light, the bull's-eye intervening between them. In this case the lamp should be very low and the microscope raised on some solid support. The small camera or stage for the slide may represent the slide itself if made with a tube that fits easily some little distance into the draw tube of the microscope, and if it have a shutter of easy motion fitting light-tight beneath the sensitised plate, which is placed in the little camera in the dark room and the back shutter closed down as in the ordinary slide before leaving it; the focussing having been

previously made by using a plain glass with some very finely made diamond lines on one surface which is placed downward, and corresponds to the same plane as the surface of the sensitive plate will take when substituted for the ruled glass. If the entering tube of this camera slide be made with a stiffly moving collar on the outside, or by a set screw collar, the position can be found where the image that falls on the ruled lines, as examined and focussed by a good Ramsden's E. P., corresponds with the image as focussed by the ordinary E. P. (No. 2). This perhaps is the simplest plan, and if carried out with due attention the camera slide can be held ready and substituted after removal of the E. P. The position of the lamp and bull's-eye should, however, be more carefully arranged, for perfect illumination is required. The little camera slide can be made in thin brass, blackened, and of internal size to take a plate made by dividing the ordinary $3\frac{1}{4} \times 4\frac{1}{4}$ plate into four equal parts, or by cutting up a 4×4 or 5×4 plate. The plan suggested by Moitessier was to have a stage resting on the top of the microscope in which was placed the slide made after the pattern of the frame slide with two



shutters, or even for four exposures or more, if used on the top of a frame surrounding the microscope. Others, as Dr. Beneke, have had the slide to rotate and present eight apertures or exposures on one plate, after the fashion of the rotating diaphragm wheel.* Such naturally demand excellency in workmanship and extreme care in usage. The writer does not advocate more than the single or at most the stereo form, the focus being so easily disturbed if the parts be heavy. The chances against this might be attempted by making the little camera adjustable on a stem and foot with a locking universal joint so that the tube of the small camera could be made to enter the draw tube without absolute contact at any part, yet sufficiently light-tight. It would extend this article beyond undue limits, which the writer feels have even now been exceeded, to enter on the question of the merit of the amplifier *versus* the eye-piece, but it has always been preferred by the writer to retaining

* Dr. Roux now employs a slide of great convenience. One end, light tight, encloses the sensitised plate ready for exposure, the other open end contains the focussing plate; the under surface of each lying in exactly the same plane.

the ordinary eye-piece in position. These remarks have been made in the hope they may help the decision of any in doubt on the original question.

CARBON OR PLATINUM?

By G. Watmough Webster, F.C.S.

'Not either, but both,' I would say. There appears to be an impression abroad that one should 'take sides' on this question, that there is a great rivalry between the two, that the good carbon printer should be brought up in the way of hating the plantinotypist, and the latter bound to show his contempt for the former. But this is quite a mistake, for, in effect, the two processes do not occupy much ground in common, and where they do there need not be any question of mutual opposition. I have had considerable experience with both processes, and I find that there are few cases where the use of one militates against the other. The great difference in the scope of the two lies in the ready adaptability of platinum to the everyday wants of the photographer in a certain direction, and in the large range of carbon in another. An example will better explain my meaning. Few persons would think of attempting carbon printing if they had to print not more than two or three copies of any particular negative, and at such odd times only as the amateur commonly has at command. But with platinum he may have portraits, landscape, and architectural negatives, and print a small number only of each, and yet get the highest class of result obtainable, though he give to his hobby only a few odd hours such as morning and evening, or half-holidays, and cannot tell from day to day when he may start printing operations. This would be utterly impossible with carbon, if only because of the comparative want of keeping power in the tissue (though a good sample may any time be kept about a fortnight).

But, on the other hand (not to speak of magic lantern and other transparencies), if he wish to produce enlargements from negatives of varied class and quality, platinum is out of the field altogether, as also it practically is with any negative of indifferent quality. Then, again, it is not every one who cares for platinotype pictures, the greater richness due to the glazed surface of carbon or silver still being greatly in request; the same craving for so-called 'brightness' operating very greatly to the disadvantage of platinum when small portrait work is required. It is impossible to imagine the public ever preferring a platinotype half-length *carte-de-visite*, for example. Then, also such work as copying oil paintings, reproducing indifferent negatives, and so on, is in most cases far better done in carbon than platinum.

As to the actual working of the two, there is everything in the latter to attract the amateur, for it can easily be learnt, while carbon needs so much knowledge and experience that it is more especially the professional's than the amateur's process. It is matter for surprise that it is not worked by a larger number of professional photographers than appears to be the case, for it is, after all, very easy to learn, and after going through the usual round of failures that is necessary to the proper understanding of all things photographic, there is no photographer worthy of the name who would not readily master all its requirements.

The Autotype Company have made an important step towards popularising the process by supplying sensitive tissue in small quantities ready cut up to stock sizes, from those suitable to lantern slides upwards, and in tissues of different kinds—black, brown, red, or transparency. There is something so very interesting in watching the gradual development of a carbon print that it is worth while learning the process if only to enjoy a new sensation photographic. For such pictures as opal it offers very great facilities.

As to the working of platinotype, it is not to be supposed that there is nothing to learn as it appears so simple, for such is not the case. Some little practical experience is required to know, if good results are not obtained, when to blame the paper and when the manner of storing it. There is no doubt that the Platinotype Company must receive many a letter of complaint when blame should rest on the shoulders of the writers. Some knowledge and practice is needed to enable the worker to know which particular paper to select, and how to bring out the beauties of a negative by using a sample that has been kept a little time on the one hand, or is brand new on the other. It must also be said of this process, which is nothing if not artistic, that it is no use attempting to print in it from a poor negative; of course prints of a sort can, as with all processes, be obtained, but the plantinotype worker must not attempt to bend an artistic medium to the use of inartistic means.

A very extensive department that autotype has almost monopolised is the production of enlarged portraits to be utilised by the portrait painter to paint on or upon, most frequently the latter, as for merely tracing, where permanency is no object, a silver print is the handiest of all and as useful as any. With autotype almost any surface may be had; platinotype is more restricted—there is a rough and a smooth paper it is true, and for practical purpose it might be said that that was enough, but it is certainly pleasant to be able to have a good sheet of Whatman's paper under one's fingers when using a stump or charcoal, and it is very easy to prepare. I have been for many years past in the habit of having my Whatman's paper prepared on my own premises, though I do not keep a special dish for floating it. The plan I adopt is to clip each corner of an imperial sheet with American clips (after having first made a narrow fold along each side), and then to pour the gelatine and chrome alum solution on and off, and, finally, to hang the sheets up to dry. A very nice paper to work upon for smaller heads is that sold as 'vellum-wove,' with the 'mill finish.' This has to be ordered purposely, and it is apparently objectionable on account of the water-mark name being repeated so often on the sheets, they being made for the purpose of being cut up into sheets for note paper and envelopes. Practically, however, this mark shows so little when the print is mounted that it does not in the slightest degree injure the appearance of the picture.

To treat further of the actual employment of these prints in artistic pencilling or painting would render this article too long for Almanac purposes, and as the subject is both important and interesting, I will hope to treat it at length in the pages of the parent Journal of which this Almanac is such an important offshoot.

FIGURE, LANDSCAPE, AND COMBINATION PRINTING.

By H. P. Robinson.

Although not really a rule of composition, it has been for years a sort of, shall we say stage direction? that in landscape pictures the figures, if any are introduced, shall be subordinate to the scene, and that if figures are the subject, that the landscape shall be kept down. This is a good healthy direction if it is not abused, but like everything else that is good—even combination printing—it is worse than useless if it is not properly understood and applied, and will tend to fetter instead of help the artist.

But there are no rules without exception. In *Pictorial Effect* I have said that good pictures may be made without much sacrifice of either landscape or figures, 'but the subjects must be fine, and the skill of the artist great, or the success would be hazardous.'

Well, I think that all will agree with me that the skill, both of painters and photographers, has greatly increased of late years, and that many of them need not be afraid to attack difficult subjects. That painters are not now afraid of subjects in which both figures and landscape are of importance and are harmonised, is increasingly evident annually in the Exhibition of the Royal Academy. It was especially noticeable in the last exhibition, where such pictures were conspicuously numerous on the line.

Photographers always seem to look to painters for authority in art—here they have it, and, therefore, it is legitimate to place large figures in important landscapes.

There has always, to those who limit their ambition to what can be produced on one plate at one exposure only, been a technical difficulty in the way in any attempts of the photographer to obtain these pictures—the difficulty of getting focus and definition in sufficient depth. It is found that in the endeavour to get a large figure in the near foreground, with a distant scene as background, any approach to possible focus is hopeless; one or other must give way. Now, although I do not object to parts of a picture being judiciously a little out of focus, any quantity of undefined smudge is not to be tolerated. Therefore these very tempting subjects must be given up, or done in some other way. Fortunately there is another way. By the aid of combination printing subjects beyond the reach of ordinary photography may be successfully grappled with.

I am quite aware that a great attempt has been made by the editor of a contemporary to discredit this method of printing during the year, but there were other reasons, quite apart from the good of the art (which should be an editor's only thought) to account for these ebullitions. Here is one of them. Some people often overlook the real meaning of a picture, but are very sharp and pleased to detect joins which do not exist, and I charitably feel that they should be gratified in their harmless amusement, and, therefore, sometimes purposely drag a red herring across the scent, by leaving lines which the ignorant would take for joins, and distract his attention from the real ones. Once upon a time a certain writer, whose want of knowledge of art is phenomenal in these days, when it is taught even in Board Schools, and whose smattering of science often leads him astray, so that anything he says is of no practical value, was misled into pointing out, with an air of authority, these imaginary joins. This mistake had a potent effect on him, and

ever since he has done his feeble best to discredit combination printing; of course, with no effect on the minds of those who seriously desire the advance of photography.

These attacks were ingeniously written, but whether the power to write such nonsense is any excuse for the error of thinking it worth printing is doubtful. That he does not believe a word of what he writes on the subject himself is his punishment, and must enhance the beauty of the performance for every well-regulated mind. It must be rather a 'flat delight,' to quote George Herbert, to write that which you do not believe on the off chance of being disagreeable. However, we will get away from an unsavoury subject, not worthy of notice if the journal to which I allude had not enthusiastically encouraged combination printing and all that was worthy in the art for a quarter of a century, until it had the misfortune to fall into the hands of its present editor, whose strange object seems to be to discredit photography and photographers.

It would be useless here to go into the details of combination printing. My purpose at present is to point out how very much further this method enables a photographer to go, and that the process is not nearly so difficult as it looks. All that is necessary is to determine never to uselessly apply the process, never to do on two plates what can be done on one, and to thoroughly study your subject before you begin it, so that there should be no departure from the truth of nature, and that the necessary joins come in the easiest and most natural places. Everything else is simply a matter of care and patience.

But supposing there are difficulties. The photographer should rejoice that there are still left in the art some things calculated to call for all the knowledge and power that skill and experience can bring to bear to produce a successful result.

CLEARING NEGATIVES PRIOR TO INTENSIFICATION.

By H. M. Hastings.

In a paper read by Mr. Dunmore at the Photographic Club on 'The After-treatment of Negatives,' he dealt especially with those which had been over exposed, and recommended their clearing with Howard Farmer's ferridcyanide reducer and then intensification. It has been my practice for some time past to clear all negatives which require intensifying previous to performing that operation. The reducer I employ, however, is one the formula of which was given me by Mr. Cowan, and which he recommends for clearing his gelatino-chloro-bromide plates for lantern transparencies. This I have always found a most effective reducer, and as it does not seem to be generally known, except to those who have worked with these plates, perhaps I may be permitted to give the formula here for the benefit of those who may wish to try it. A solution is made as follows:—

Hydrochloric acid	½ ounce.
Strong solution of perchloride of iron*	¼ ,,
Water	20 ounces.

On taking the negative (which I always immerse in a solution of chrome alum between developing and fixing) from the hypo bath, rinse

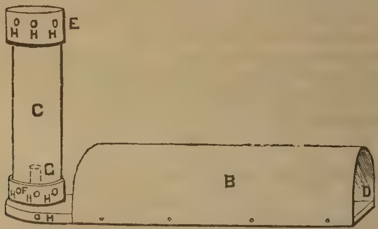
* Sold by chemists under the name, Liq. Ferri perchlor fort P.B.

well under the tap, then dip for a few seconds in some of the above solution, again rinse and place for a short time in a clean hypo bath. Should further reduction be necessary these operations may be repeated, rinsing well between each stage. The action of the perchloride being very rapid, it is advisable to proceed cautiously. When I purpose intensifying afterwards I use the solution weaker (about equal parts of it and water), as only a slight clearing is required; and in my experience I find a negative so treated takes the intensifier more readily, at all events with the Monckhoven method, which I usually employ. I much prefer this reducer to the ferridcyanide, as it has not so great a tendency to stain the gelatine.

PORTABLE DARK-ROOM LAMP.

By Thomas Gulliver.

I enclose sketch of a useful, easily made, and cheap dark-room lamp. The baseboard is 11 inches long, ⅜-inch pine, 2½ inches wide, and 2⅝ inches deep. The ruby glass is the ordinary straight tube as used for gas. This is kept in stock by most dealers. The tin socket is 1¼ inches deep, and made to fit the ruby glass chimney, the top, E, 1½ inches deep. The cover, B, 1¾ inches deep and 8½ inches long. The sketch shows the lamp



A. Baseboard.
B. Tin lamp-glass cover.
C. Ruby lamp-glass.
D. Open end for ruby glass.
E. Tin perforated cap.
F. Socket for ruby lamp-glass.
G. Tin socket for candle.
H. Holes for ventilation.

ready for use. When it is done with the ruby glass is put in at the open end, D, and a cover shuts in and secures it from breakage. The cap is placed on the socket, F. It then forms a small parcel for travelling, 11 inches long, 2½ inches wide, 2¾ inches deep, and weighs only 12 ounces.

The tin and woodwork is painted over with black enamel varnish, so does not look unsightly

IMPROVING OVER-EXPOSED NEGATIVES.

By Edward Dunmore.

Having in my mind's eye the numerous thin, over-exposed negatives, a word or two about making the best of them will, perhaps, be as good as anything I can think of as my contribution to this year's Almanac. Given, then, a thin, over-exposed negative from which it is impossible to get a bright print, we will proceed in the following manner. Make a solution of

hyposulphite of soda of a strength of five grains to the ounce of water in one glass, and in another a solution of ferricyanide of potassium of the same strength. The negative being laid in a white dish, mix the two solutions in equal quantities and pour over it. This operation is best done by artificial light. A paraffin lamp with a reflector is about the best thing, as a strong light is required, and placed close to the dish. Having beforehand noticed some part of the negative that should be nearly clear glass, carefully watch the disappearance of the image until the white of the dish shows well through that part, yet not quite clearly, as the action continues a little after removal. When this stage is reached, immediately take it out and well wash under a tap; place it in a dish of clean water to soak for an hour; another rinse, and then dry. The image will now be found a mere ghost. To get it up to proper printing intensity use a saturated solution of bichloride of mercury in water at sixty degrees, to which twenty grains to the ounce of bromide of potassium has been added. Place the negative in this until it is white through. Wash well, and then place it in a bath of cyanide of silver, thirty grains to the ounce, which will immediately blacken it. When blackened through evenly to the back, it must be well washed and dried, and the probability is the negative will be bright and strong; if not, repeat the mercury and cyanide process until it is. This plan was suggested by Dr. Monckhoven with weaker solutions, but it seems necessary to have a strong mercury solution in the first instance to get the best effect. The reducing with ferricyanide was, I believe, first suggested by Mr. Howard Farmer, and upon the careful conduct of this operation most of the success depends. If carried too far the image is irregularly eaten away, and if not enough, the intensifier will block up the shadows; but, providing it is properly done, many a bad negative can be recovered from the waste.

DEVELOPING FORMULÆ.

By Lyonel Clark and Enrico Ferrero.

The arbitrary and unscientific way in which makers of dry plates make up their developing formulæ has long been the cause of much discontent amongst amateur photographers. They may suit the professional who uses only one brand, practises only one branch of the photographic art, and has no time for scientific studies. They may also suit the beginner who does not know any better, but let this beginner take it into his head to try a new brand of plates and he will begin to realise that something is wrong. He will find that he must make fresh solutions, as he cannot tell from a comparison of the formulæ what is the difference between the proportions recommended by one maker and the other. Now there are very few amateurs who stick constantly to one brand of plates. Moreover, the amateur usually tackles many different subjects, each of which requires a different treatment in development. Landscapes, buildings, panoramic views, figures, sea, and clouds, are all subjects which come within the range of the ordinary amateur, whithout mentioning instantaneous effects, interiors, copying, and even portraits. It is no wonder, therefore, that the intelligent photographer studies the action of the different agents which constitute the developer and wishes to find out the proportions which suit the different subjects.

The first question he will ask himself is, What quantity of pyro, bromide, and ammonia should an ounce of developer contain to suit the plate he is using? Only after he has found out these quantities can he intelligently vary their proportions according to the subject. But it is just these quantities that the makers seem to conspire to hide from him, and it is a work of considerable time and patience to find them out from the formulæ usually given, to say nothing of the constant mistakes which one is apt to make in these complicated calculations. We may here express our opinion that these mistakes are often due to the antiquated and irrational system of weights and measures still in vogue in this country, one of the few which have not yet adopted the decimal system.

For all these difficulties the amateur had no remedy so long as he was a negligeable quantity in the photographic world. Of late years he has, however, begun to be a very important customer to the dry plate makers, and with the increase of numbers the tendency to associate and combine —a tendency so powerful in this country—began to be felt. Small local clubs and associations were formed, but they remained comparatively obscure owing to a want of common and concerted action. The long-felt want of one central body representing purely the interests of amateur photographers gave at last birth to the Camera Club, which at once obtained enthusiastic support from every part of the kingdom. This Club is now two years old, has got over all the infirmities and dangers which test the constitution of every new born, and, having consolidated itself into a well established and permanent institution, has begun to feel the necessity of becoming a useful member of society, and thus justifying its existence and its claims to the support of the amateur photographic world.

The question of formulæ was one of the first to suggest itself as requiring a solution. It was already a general custom amongst intelligent amateurs to mix their chemicals into so-called ten per cent. solutions. One of the first to advocate this system was Mr. W. K. Burton in his excellent book, *Modern Photography*. The appellation 'ten per cent.' is not scientifically correct, and we prefer to call it a 'one in ten solution,' as it signifies that every ten minims of the solution contain one grain of the salt. The advantages of this system are evident, as it can be adapted to any formula and shows clearly and without tedious calculations what are the proportions of the developing agents used.

All that was required in order to make this system easy of adoption was an analysis of each of the formulæ sent out with the different brands of plates. We were asked by the Committee of the Camera Club to undertake this analysis, and, if our task was somewhat laborious and tedious, we have felt amply rewarded by the reception accorded to our work, not the least flattering expression of which was the request of the Editor of this ALMANAC for permission to print it, and for a short article to accompany it.

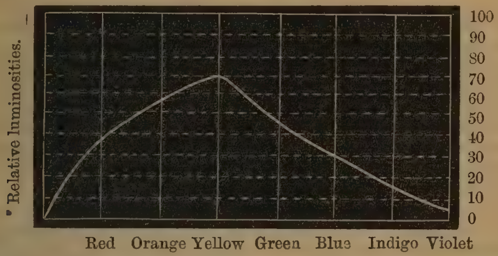
In order to insure as much as possible the accuracy of our table, we submitted the analysis to all the makers concerned, and were pleased at receiving, with hardly any exception, replies from all the makers of the best known brands. This shows that makers take an intelligent interest in their plates, a circumstance which promises well for the future of dry plate photography.

PHOTOGRAPHY AND COLOUR.

By Howard Farmer.

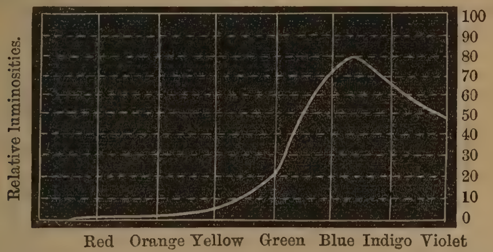
A good deal of attention is being paid to the subject of representing colours correctly in our photographs (I mean, of course, in monochrome). It may be useful to consider some of the methods which are available to attain this result.

The relative luminosities of the pure spectrum colours of white light, as judged by the eye, are shown roughly by the ordinates in the annexed curve—or perhaps a clearer statement will be, by considering the eye as a photographic camera and the retina as a sensitive film; then the height of the ordinates in the curve will represent the relative sensitiveness of each colour.



Obviously the same curve also represents the relative sensitiveness to different colours of what may be termed an ideal photographic film, for a curve which is correct for the pure colours will be so for every variety of tint and shade, inasmuch as the latter all consist of mixtures of the pure colours, *plus* or *minus* white and black.

Let us now see the curve our present films give, or, in other words, their relative sensitiveness to different colours.



The above curve represents the relative sensitiveness to colours of an ordinary bromide plate. Anything more opposite to an ideal film it is hardly possible to imagine. It becomes, then, a question what methods are available for modifying this latter curve so that it may approach or actually become identical with the ideal curve. The methods are of

two kinds, chemical and physical, the chemical, which we will consider first, being three in number:—

I. By altering exposures.
II. By the use of colour sensitisers.
III. By the use of restrainers.

I. When a sensitive plate is exposed for a longer period than that necessary to produce an image a reversal may be set up, and which will first occur where the maximum effect has taken place; hence the yellow and other colours can be increasing their action while the blue is undoing itself. This method is daily used for improving colour effect. It is of very limited value, for not only does blue undo itself (which is wanted), but white even more so (which is not wanted). Also the well-known effects of over exposure—*i.e.* loss of detail, gradation, and brightness—occur.

II. Ever since Dr. Vogel published his discovery that plates stained with certain coloured substances could be rendered sensitive to the colours these substances absorbed, they have been used with greater or less success for this purpose. The more oxidisable aniline dyes are generally preferred, also tumeric, chlorophyl, and indigo are used. The conditions under which the dye is used are of great importance. Mr. Carey Lea found a great increase in sensitiveness by dyeing the sensitive salt as distinct from the vehicle in which it was suspended. Dr. Eder has confirmed this result.

III. When a silver salt such as bromide is rendered fully sensitive in gelatine by digestion or otherwise, it is found to be little affected by sensitisers, whether they be coloured or not; but in the case of collodion plates which contain a powerful restraining substance—pyroxyline—sensitisers are found to have a greater action. When a restraining substance is added to a gelatine film it also becomes amenable to the action of sensitisers, and in the case of coloured ones the reproduced sensitiveness may in a great measure occur with the colour it absorbs.

We must now pass to the physical methods, remarking that although great benefit is derived from using coloured sensitisers, &c., as regards sensitiveness to the yellow, red, &c., are concerned, yet the films still retain their abnormal sensitiveness to blue and violet.

The physical methods are:—

I. Illuminating the subject with coloured light.
II. Using coloured media next the lens.

I. It is obvious that by illuminating objects with different coloured illuminants we can obtain almost any desired action, but it is even more obvious that, as nearly all our work is done by daylight, we cannot vary the colour of our illumination at will.

II. This method, the last we shall consider, is employed in all the processes used for obtaining correct colour effect, but its real value is seldom appreciated. Suppose we have some stained plates, and have found by trial that their relative sensitiveness to blue and yellow is as 80 to 20 (4 to 1), a very likely proportion, and we have a piece of yellow glass one-sixteenth of an inch thick, which stops fifty per cent. (half) the blue light to ten per cent. (one-tenth) the yellow.* Then, with the glass

* The proportion of any colour a piece of glass absorbs is found by exposing with and without glass on colour, and finding the alteration in exposure required.

placed next the lens, the relative sensitiveness will be obtained by finding the relative quantities of blue and yellow which pass through. Thus:—

Relative sensitiveness without glass.		Portion of light stopped by glass.		Relative sensitiveness with glass.
Blue 80	–	half	=	40 blue.
Yellow 20	–	$\frac{1}{10}$	=	18 yellow.

Or blue is only about twice as sensitive as yellow instead of four times.

Now the law of absorption states that whatever proportion of any colour gets through one thickness of glass, the same proportion *of the residue* will get through the next equal thickness, and so on. Supposing, then, a similar glass of *double thickness*, *i.e.* one-eighth of an inch, is used, we get—

Blue 40	–	half	=	20 blue.
Yellow 18	–	$\frac{1}{10}$	=	16·2 yellow.

Or the relative sensitiveness of blue and yellow are nearly equal.

With a third thickness, *i.e.* three-sixteenths of an inch, we have—

Blue 20	–	half	=	10 blue.
Yellow 16·2	–	$\frac{1}{10}$	=	14·6 yellow.

Or the yellow is more sensitive than the blue.

Finally, on using four thicknesses, or one-fourth of an inch, we get—

Blue 10	–	half	=	5 blue.
Yellow 14·6	–	$\frac{1}{10}$	=	13·2 yellow.

Or the yellow is nearly three times as sensitive as the blue.

On referring to the ideal curve it will be seen that this is just about the relative sensitiveness we have assumed they should have. Two colours only have been taken for simplicity, but the same holds good for all the other colours; so that by employing, in conjunction with stained films, a piece of glass (or other coloured media) of *suitable thickness and colour*, we can not only make the curve of relative sensitiveness given without films approach that given by the retina, but can make them *absolutely identical.*

It will be noticed that sensitisers act by increasing the sensitiveness to yellow, red, &c., and do not necessarily entail a total reduction in sensitiveness, but theoretically an increase. On the other hand, the coloured glass acts by stopping a portion of those colours to which the films are too sensitive (relatively) and necessarily reduces the total sensitiveness. Therefore, the greater the sensitiveness to yellow, red, &c., obtained, the less blue, &c., there will have to be abstracted and the greater the general sensitiveness.

SHUTTERS.

By Francis Cobb, F.R.A.S.

One would think from the number of different shutters now offering and supplying every taste, that there ought to be no difficulty in selecting one calculated for any requirement, and it probably is a fact that if one could carry half-a-dozen shutters as well as half-a-dozen lenses all wants might be supplied.

To read up the literature of shutters and attempt to act upon the

precepts therein conveyed is simply maddening. One reads in the journals, 'The only correct place for the shutter to work is between the lenses.' Again, 'There can be no doubt that the best position for the shutter is in front of the plate.' 'Some of the best work yet produced has been by Blank's shutter worked pneumatically close behind the lenses.' 'For general purposes there is nothing better than the old drop shutter,' &c.

Abney says: 'The theoretical form that a shutter should take is that the full aperture of the lens should be exposed for as comparatively long a period as possible, whilst the uncovering and covering should take place as rapidly as possible.' It is doubtful if that definition meets all the requirements of the present day, for there is frequently an advantage in getting a larger exposure to a foreground than to the sky, and a flap shutter does this to some extent; but others contend that the horizontal movement is really the only safe one, while its opponents declare that the starting of the springs cannot be accomplished without a certain amount of vibration. For the same reason all 'go and return' shutters are condemned by some, while they are lauded by others who profess to speak from practical experience. Shutters which admit first and retain longest the marginal rays should theoretically be faulty, yet there are at least two of this description which have high reputations for instantaneous work. Flap shutters opening to right angles, when a drop falls behind, will, when at the right angle, give a wedge-shaped shadow on the plate, but it cannot be denied that excellent work has been done with such shutter, notwithstanding the theoretical wedge shadow which does not often put in an appearance. A good workman will produce good work even when his tools are not what they should be, and some experienced photographers can take instantaneous views without any shutter at all. One cannot say now if the celebrated gull picture of many years ago was taken with a shutter, but the general opinion of contemporary photographers is that it was not; be that as it may, a present member and medallist of the Photographic Society is in the habit of giving rapid exposures by a clever manipulation of his focussing cloth and dispensing with a shutter altogether. The flap of the old Ross lenses also dispensed with the shutter, and the wedge-shaped shadow was guarded against by the flap being made much wider at the bottom than at the top. A well fitted cap can be raised from the bottom, worked as if the top of the cap were hinged to the lens, and replaced in half a second. By working two caps, that is to say, the cap uncovering worked by the left hand, and the covering one by the right, the time can be reduced to a quarter of a second and full exposure obtained. A breaking wave has been taken in this manner with clear definition.

If a person will take a pair of parallel rulers and suppose in the upper bar a crescent to be cut measuring in the bottom once and a half the diameter of the lens, one of the brass connecting rods to be elongated so as to form a lever to work the rulers, and the whole made to attach to the lens, so that when the lever is perpendicular the top of the crescent coincides with the top of the lens, then one might see the best principle of the shutter applied in the most efficient manner. The greatest exposure is given to the foreground, the least to the sky, and the exposure can be delayed or expedited at the will of the operator. The only drawback being the size of the shutter, which makes it cumbersome, especially in a strong wind or on board yachts.

THE GAS TANK.

By Thomas Gulliver.

Some two years since I sent a descriptive account of a gas tank I just had made, but not tried. Will you allow me to give a few particulars of the advantages and disadvantages of the same?

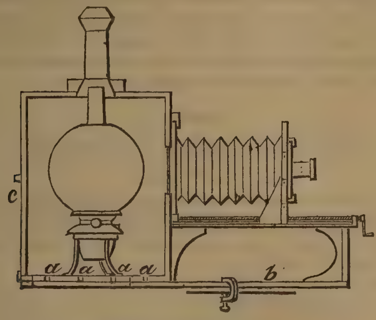
First, it requires but a small quantity of chlorate of potass; twelve ounces has kept a spirit jet full on for one hour and twenty-eight minutes, single lantern sixteen ounces when using a blow-through jet, and single lantern one hour and thirty-eight minutes. Secondly, it occupies but little floor space (15 × 11 inches). This I have found to be advantageous when working the limelight for living waxworks at a bazaar, also at a music hall, converted for the time being into a theatre, there being no room for a gas bag, except a very small one. Thirdly, there is but little trouble to get weights—two bricks, a lump of coal, some books, in fact anything; about twelve or fourteen pounds is quite sufficient.

The disadvantages I have found to be the filling and emptying the water tank—three buckets or so; and on one occasion I had to stop making gas to lift the gas-holder a little, but that only happened once.

ENLARGING WITHOUT A CONDENSER.

By Major Barrington-Baker.

I was very desirous of making enlargements of some of my half-plate landscapes which I had brought from abroad, but the prices, 10*l.* to 12*l.*, charged for lanterns appalled me. I asked questions of everybody at the Convention last spring, and elsewhere, read all I could get hold of on the subject, and finally came to the conclusion that I did not see why I could not do without the very expensive condenser. I therefore, after several failures, made the cheap apparatus of which I send you a drawing



a a a a. Ventilating holes.
b. Three slips of wood screwed to bottom of case.
c. Door.

The lamp or lantern is an ordinary deal case of half-inch stuff, with a hole 6¼ × 4¼ for the negative. A Belge lamp, forty-two candle-power,

stands in the centre, half a dozen holes being bored in the bottom of the case for ventilation. A ten-inch opal globe is used, the centre of which is a trifle higher than the centre of the negative, the film side of which is outwards. The negative fits into a slight rebate, and is held in place by a very small turnbuckle. The bellows is fastened to a frame, which (the negative being already in place) is held by another turnbuckle at the top, the bottom ends fitting into notches.

My camera front, with lens, fits the bellows front, and is racked out in the usual way by a central screw. I use a *carte-de-visite* lens of about five-inch focus if a head or small portion is to be enlarged; but if all the half-plate is required I use my Ross' rapid symmetrical, of ten inches focus.

I at first used Eastman paper; but the exposure was so long—90 to 200 minutes—that I began to despair. Some other papers were then tested for me, and I was advised to try Morgan & Kidd's contact paper, which has nearly seven times the rapidity. I now find that with the *carte-de-visite* I can enlarge in from seven to twelve minutes, according to density of negative and size required; with the other lens it takes from eighteen to forty minutes, with by no means bad results. The apparatus is very inexpensive, and the lamp is frequently used elsewhere in the house when not wanted for enlarging.

A drawing board, with a sheet of white paper pinned to it, is hung against the wall, the lantern is placed upon a table, the lens facing board, and exactly opposite its centre. Dimensions of enlargement having been decided upon, reference is made to a table prepared for each lens, showing distances required for the various sizes. The lens is racked out to the proper focus (scale of inches marked on bottom board); lantern placed at proper distance from drawing board, measurement being roughly taken with marked stick; the lantern is then clamped to the table, a special negative with very clear and distinct lines inserted, and carefully focussed. This negative is then removed, the proper one inserted, lens capped, board taken into dark room, and the bromide paper fastened on with ordinary drawing pins, and again hung against the wall. The board being suspended by two small loops to two nails is always in the same position. It has, also, lines ruled across it, so there is no difficulty in using small papers for a special section.

DRYING GELATINE NEGATIVES.

By J. Werge.

Most people will think that it is a simple and easy operation to dry gelatine negatives; and so it is when the necessary conditions are observed. Yet I have seen many negatives completely ruined for want of attention to those conditions.

One of the worst modes of drying gelatine negatives is to place them in a rack with the grooves too close, and to set the plates too near each other. That method of drying is frequently attended with serious damage to the negative, especially in damp weather, for then the plates dry very slowly and only round the edges, between night and morning, leaving the centre of the film quite wet and the back of the opposite plate coated with condensed vapour, which checks the further evapora-

tion completely; and if the slightest trace of hypo has been left in the film, a transparent patch in the negative, owing to the reduction of density by the prolonged action of the hypo, is sure to be the result, the degree of transparency depending entirely on the length of time the plates are drying and the quantity of hypo that has been left in the film.

I have recently seen some very valuable negatives with transparent patches in the centres, which I could not at first satisfactorily account for or explain. The films were tolerably even, the exposure was about right, and the development had been successfully performed, for the pictures were all there; but a kind of vignetted transparency was inth centres of several. This puzzled me, and on showing these defects to others no one could account for them. Some thought the developer had not been kept on those parts long enough; and that was my first impression, but I could not produce similar appearances in that way. Then it occurred to me that the pictures had all been equally dense when they were taken out of the developer, but reduced in density in those parts by something that had happened afterwards. Suspecting hypo and slow drying to be the sources of the evil, I produced the defects by setting two or three insufficiently washed plates very close together, without touching, and leaving them to dry in that condition. In the morning the centres were not dry, and there were the transparent patches. Conclusion—Wash *well* and dry *quickly*.

Of course, no one will think of applying heat to hasten the drying of gelatine negatives nowadays, though that has been done with comical consequences; but rapid drying is desirable, and the safest way to effect that is to immerse the plates, after washing, in a bath of methylated spirit, set them well apart in the draining rack, and place them where a good current of air can pass freely between. If these conditions are carefully observed, it will be almost impossible to ruin negatives by producing such transparent patches as I have described.

QUININE AS A PRESERVATIVE OF PYRO.

By J. B. B. Wellington.

After I had discovered the beneficial use of quinine to preserve the longevity of a gelatine plate which had been treated with a dye, the working of which I recently described in a paper read before a meeting of the Photographic Club, I noticed that plates so treated gave a much greater density than before the plate was so treated. This at first I thought was due to the dye, and this in some cases is so, but quinine in conjunction far more so. On trying its use with pyro, not only is it a preservative, but it also gives an increase of density, so that with plates that give a thin image its presence is a decided advantage. I cannot say that it is any better than other preservatives, but being something new it is interesting to place it before your readers. It is more energetic in its action than pyro preserved with citric acid, in fact, it behaves almost similar as plain pyro and ammonia, with the advantage of its keeping properties; it becomes rather more discoloured when mixed with ammonia than does the pyro preserved with citric acid, and moreover it produces bubbles (becomes frothy) which plain pyro and ammonia is apt to do. In

conjunction with pyro and potash the speed of the plate is increased about three times. For one ounce of pyro I use sixty grains of the soluble sulphate of quinine dissolved in hot water and allowed to cool before adding the pyro. The more concentrated the solution the more will the quinine crystallise out, but this is of no matter. When mixed it assumes a pale golden colour.

AMATEUR RETOUCHING.

By T. N. Armstrong.

In the paper on 'Home Portraiture' which I had the honour to submit to the members of our late Convention, I dwelt strongly on the necessity of an amateur being able to retouch or model his negatives. Since then I have had repeated applications for further information in this interesting branch of photography, and several have reminded me that although advocating retouching, I gave no information in my paper how to retouch.

Now, Mr. Editor, seeing you have so kindly asked me to contribute to your valuable Almanac, it has occurred to me that were I to put together a few practical remarks they might be appreciated by some of the many amateurs whom your Almanac is sure to reach. In doing so I wish my readers to understand I am not going to give them a treatise on retouching, but merely an elementary lesson, but one which I trust may be sufficient to enable them to overcome their first difficulties and give an insight into what, after all, is not such a difficult operation as many imagine.

When I first made up my mind to learn something about retouching I read all the books and articles I could find. I was told it was very difficult and that I had better give my negatives to a retoucher to have them properly done, that I would be sure to spoil any I tried my prentice hand upon, but I said to myself, 'I don't see if others can do it what is to prevent me.' So I decided to take a few lessons from a competent teacher. I was given to understand from what I had read that quite a dreadful list of articles were necessary, such as powdered cuttle fish, ground resin, powdered black lead, Indian ink, stumps, sable brushes, &c., but I soon found in this, like other things, ocular demonstration was best, and my teacher soon put me on the right road without the aid of anything but a lead pencil. At first I had not a retouching desk, but I made a good substitute by using a broken-down printing frame. A desk, however, is necessary.

I find a very prevalent notion existing among amateurs that a negative requires some special preparation before it is ready for retouching, such as the application of a retouching medium to cause the pencil to bite, as the saying goes. Now it is very seldom such is necessary. If your negative has been properly varnished with a good spirit varnish it should need no medium, but there is a little secret in this varnishing which I will tell the beginner. If you want the varnish to take the pencil, *do not heat the negative over much either before or after flowing on the varnish.* Just *warm* the plate and when thoroughly dry and hard the pencil will work nicely without a medium. Another error beginners make is the idea that a *soft* pencil is necessary—here again they are wrong. Of course

it is handy to have a soft pencil at hand for a special purpose, but as a rule a negative of good printing density should take a very hard lead best. Most of my portrait negatives are worked up with HHHHHH (Faber's), and seldom do I use softer than HHHH. The pencils must be very sharp and long pointed. I use a rough piece of ground-glass—some use sandpaper for getting a very fine point—and if after a few minutes it should be found the lead is not working, although quite sharp, I just give the point a slight rub on my coat sleeve, when I go ahead again all right.

We will now suppose all is ready to begin operations and that we are sitting down before our desk, which should be so placed that no light falls from behind, but is transmitted *through* the negative by means of the reflector in the desk. This done, and sitting so that the negative is not too near, but from about a foot to a foot and half off, take a good survey of the bad places; look first at the dense parts or high lights. Should there be any specks or patches less opaque than their surroundings, you must make them of the same opacity. Then examine where the high lights join the middle tints or half tones, and where these again join the shadows; if they verge too abruptly into each other blend them gradually together. In beginning you must touch very lightly, especially so in the middle tints and shadows; do not for one moment think you are working a sketch on paper. Only let the lead just touch the varnish, do not press it on. Here is where the beginner is most likely to go wrong; he will have an idea that unless he can see the marks the pencil makes with each stroke, dot, or touch they give, that the lead pencil is not doing its work. This is just the very thing they must avoid doing. Although you do not see the marks the pencil makes, you will find the *flaws* or inequalities on the negative disappearing in a mysterious way, and this is just what it should be. *Bear this in mind as a rule, the moment you see the touch the pencil is making* you are working dangerously near over density. Only work so that you observe the irregularities disappearing. Most retouchers acquire a special touch of their own; practice will soon teach you. Never attempt to fill up a spot with one touch, but so work the pencil as to require many. Retouching requires great patience—you must not hurry. I have sometimes been quite disheartened when commencing on a large head, the face of which has, as it were, been completely riddled with freckles. After a time, however, a degree of pleasure takes the place of despondency when it is seen that the face is gradually rounding up.

We will now suppose we have gone carefully over the face and taken out the rough inequalities. Many would stop here and say, 'Hold, I have done enough,' and perhaps wisely so; still, should your negative want contrast, you can easily assist the high lights by a little judicious touching.

Sometimes through badly lighting the sitter the catch lights are not the same in both eyes. With a sharply pointed needle it is quite an easy matter to remove an objectionable flare, but a beginner had better leave the eyes alone until he has become proficient otherwise. After a little practice, however, it is wonderful what courage he will have, and liberty he will take with his negatives.

Sometimes through under exposure or wrong development the shadows will be hard. My advice is, take a new negative; should you have no

alternative but to make the best of a bad job, then in such a case a deal can be done by flooding the glass side of the negative with ground-glass varnish, and removing same from the other parts, and then, if required, by even washing over the ground-glass a thin wash of turmeric.

But, Mr. Editor, I find I am now going beyond the mere elementary part of this subject. Into the many little dodges open to the professional retoucher I have not space to enter, but trust from the rough outline I have given the beginner will derive some little information which may be of service in assisting him over the stile.

Lately I have become the fortunate possessor of an Eastman new pattern roller slide and have been using stripping films, which I am pleased to say have yielded excellent results, so much so as to make me incline to the belief that the days of glass are numbered. The retouching of these films is quite as easy as with glass, but I must not enter into this now; perhaps on some future occasion I may have an opportunity through the medium of your JOURNAL of saying something regarding these films. Meantime, let me conclude by saying that I am looking forward with pleasure to the meeting of our next Convention at Birmingham, when I trust amateurs will come forward in force and do what they can to make that meeting even a greater success than we had at Glasgow this year, and where I trust we may see the Convention again before many years, for the resources of the West of Scotland were but slightly drawn upon, very many places of much interest never having been visited for want of time.

'NO TAKEE! NO TAKEE! INGLISHEEMAN!'

By Colonel STUART-WORTLEY.

AMONG the quaintest experiences during a trip to the United States a few years ago, was a visit to one of the great mining towns in the Far West. The life there is rough, but most interesting to see. I had brought introductions of various kinds, among others from a Chinese photographer at San Francisco to a compatriot who was the principal photographer at the said town.

On the morning after arrival I duly called on our Chinese *confrère*, and found him an intelligent, pleasant little man, with an unusually long and handsome pigtail. He knew broken English enough to carry on an amusing conversation, but as he himself said, 'No writee, no readee, can.' Presently a Chinese sitter came in, and I begged the old Chinaman to take me first, as I wanted to bring away a real Chinese photograph, and had much to do in the city before leaving it. He stared at me in puzzled surprise, and then said, 'No takee, no takee, Inglisheeman—Chinaman onlee takee.' Begging me to reseat myself, and putting a finger solemnly on his lips, he proceeded promptly to arrange his sitter, and went into the dark room, bringing back, in due course, the slide. As soon as he had exposed he came near me and said, 'Darkee room comee, but no tellee what see?' I gave him an assurance that I would be as secret as the grave, and followed him in.

I *was* surprised; it was a long room, by no means dark, fitted with shelves full of photographs of Chinamen. A pleasant little Chinawoman was busily engaged with brush and pencil on one of these, which

I could see she was touching up to look as like as possible to the sitter, and evidently succeeding well. Seeing the astonished look in my face, the old man clapped his hands softly, and went into paroxysms of silent laughter. Finally he said, 'No chimmicallee want; my friend he takee lottee Chinamen Frisco, and he sendee me biggee boxee—allee those,' pointing with a sweep of his hand round the room. 'I buy em cheapee,' but, said he, with a chuckle, 'sellee dear. Allee Chinaman muchee alike; my wife she makee allee right.' And, indeed, when the photograph, in its neat little frame, was handed to the customer, he paid over his cash with a pleased and satisfied countenance. I found that while he was being posed the lady had watched the sitter through a peep-hole, selected a picture fairly like him, and at once proceeded to touch it up to a better likeness.

When the customer had gone, thinking to pay my friend a compliment, I asked him if he ever exhibited his works. 'Havee show! havee show! prizee get!' he exclaimed with glee, and then on a sign from him his wife went to an inner room and brought back a packet. From this packet beautiful silk handkerchiefs were unrolled carefully to the number of seven in all, till at last appeared a gilt frame some 12 × 10 inches, evidently containing the cherished 'prizee,' which was hidden from view by a special curtain of pale blue silk. First gently smoothing the gilt frame all over, my friend said, 'Fine framee, beauty framee; Melican man he bringee my prizee three days back, and say "have puttee framee," and I pay him seven dollar for framee, I so glad get prizee.' Then solemnly he withdrew the pale blue silk, and held it up before me. How I kept my countenance to avoid paining my kindly little host I know not, as I read—

GOLDEN CITY GREAT EXHIBITION,
1881.
This to certify that AH WOON *has received an award for the excellence of manufacture of his*
PEARL POWDER FOR BABIES.

Alas! the clever Yankee drummer, evidently travelling in cheap picture frames, had bested my friend Ah Woon. The card was quite handsomely got up with gold and colour, and I fancy the whole lettering was put in by hand, and he had, no doubt, victimised other Chinese exhibitors of different things whose names he had found catalogued. The frame would have been worth one dollar at the outside.

Taking a cordial farewell of Ah Woon and his wife—after the 'prizee' had been restored to its many handkerchiefs—and resisting their earnest pressure to partake of some Chinese dainties, I wended my way back into the town.

On my return to San Francisco I called on the Chinese friend who had given me the introduction, told him the story, and begged him to enlighten his friend before the story should get about, and the poor little man be laughed at all around, and the intense delight with which he himself received it I shall never forget. He jumped about and shook with laughter; he took his pigtail and waved it in the air over his head, and cried out, with tears of laughter running down his cheeks, 'Pearlee

Powder Babee! Ah Woon babee no got, Pearlee Powder no know. Why that Melican man he choosee Pearlee Powder Babee-ee-ee prizee give Ah Woon? I take trainee quick; I go tellee,' and with a prolonged Oh—h—h! he subsided breathless into a chair. Poor Ah Woon, I hope his friend gently and kindly enlightened him and his childless wife as to the fraud, but did not think it necessary to tell him what his '*prizee*' really was said to be for. At least I urged on him not to do so, and he promised discretion, and as he carried with him a present from the 'Inglisheeman' to Ah Woon and his wife, I trust that may have been a reminder to him of his promise. I really don't know what poor Ah Woon would have done had his misfortune been incautiously told to him. He was a warm-hearted little fellow, and so proud of his work and of his 'prizee.'

PREPARING GELATINE FOR LANTERN PLATES.

By W. B. Bolton.

My excuse for returning to a subject so recently treated in the pages of The British Journal of Photography is twofold: the importance to most amateurs of the utmost rapidity compatible with quality in the production of their slides, and the wide circulation of the Almanac, which brings the matter before a larger number of readers. I venture, then, to urge upon the readers of this Annual not merely the possibility, but in many cases the desirability, of utilising the gelatino-bromide process for a class of work to which it has been alleged by some to be unsuited.

As an old partisan and constant supporter of collodion emulsion for the production of lantern slides, I have been twitted with inconsistency and with 'turning my coat;' but I wish it to be clearly understood that I deny 'the soft impeachment.' I am as strongly of opinion now as I ever was, that collodion emulsion cannot be beaten, if equalled, by any other process extant, where quality of result alone is in question; but at the same time I cannot shut my eyes to the fact that its comparative slowness in working is a strong deterrent to its employment by very many amateurs whose time for such work is limited to the long winter evenings. My partisanship does not blind me to possible—nay, I will say actual—advantages possessed by rival methods, and it was only on seeing a reiteration of the charge of unsuitability made against gelatine that I was induced to take up the cudgels on its behalf.

In the first of a series of articles published last September, I pointed out the chief faults of gelatine plates for lantern purposes, and how to mitigate, if not altogether remedy them. Those faults are to a great extent, as I tried to show, of a mechanical nature, or at any rate traceable to the physical character of the gelatine, though it must also be allowed that the question of the colour of the image has much to do with the preference shown for collodion transparencies. This, after all, may perhaps be considered a mere matter of taste, and most certainly when we look at the vast change that has taken place during the past few years in the public appreciation of the black tones of platinotype and gelatino-bromide prints, it is not unreasonable to believe that tastes may change also in connexion with lantern slides. If so, one more argument

against the use of gelatine fails, for if black or cool tones come into fashion they are as easily and as perfectly produced by gelatino-bromide as with collodion, and with infinitely shorter exposures.

At least the process is worth a trial at the hands of those interested in lantern work who have hitherto pinned their faith entirely to collodion, and I shall therefore, as briefly as possible, endeavour to indicate the points to be observed in adapting gelatine to the purpose named. My remarks are chiefly intended for those who prepare their own emulsion, for as I have already said in the course of the articles referred to, I believe a better result is obtainable when the emulsion is specially prepared upon a small scale than is possible when large batches are manipulated commercially. But those who are compelled to employ commercial plates, *if they select those that are advertised for the purpose*, need not despair of obtaining good results; but if the ordinary studio or landscape plates are used, the highest quality of work must not be expected.

The first care in making the emulsion must be the proper preparation of the gelatine. This should be treated in such a manner as to secure in the highest degree the qualities of transparency, freedom from colour and mechanical impurities. Many, indeed most samples of gelatine exhibit a certain amount of opalescence due to the presence of traces of lime, and by unsuitable treatment this fault may be made to assume a prominence which utterly unfits the gelatine for the purpose we have in view. All gelatine, too, contains a considerable quantity of insoluble mechanical impurities in the shape of fibrous and dusty particles, which must be carefully and completely eliminated if the gelatine film is to approach anywhere near collodion in its transparency and freedom from structure.

In order to avoid the opalescence it is necessary to work entirely with distilled water in making the emulsion; the mere contact with most ordinary waters, though it may not produce any immediately apparent effect, certainly increases the tendency of the gelatine to show opalescence when it is submitted to the action of an alkali, as it must almost necessarily be in development. If alkaline development be replaced by ferrous oxalate, matters are if anything made worse, as the soluble lime salts are converted into oxalate of lime, which produces a more pronounced opalescence than either carbonate or sulphate of lime or lime itself. Distilled water, however, is cheap enough, so the extra expense need not cause any trouble.

The gelatine should be allowed to soak for some time until perfectly soft, and then submitted to friction in order to remove surface impurities. These are not inconsiderable, as any one may decide for himself by carefully examining the washing water after this operation has been performed. The ordinary sheet gelatine is easily cleaned in this manner, though finely shredded samples cause a little more trouble, but in both cases it is necessary.

The gelatine requires subsequent filtration in order to remove those impurities which lie beneath the surface, and this operation I strongly recommend to be performed before emulsification—that is, before we commence to render the mixture sensitive. If this plan be adopted a far greater amount of care can be devoted to the filtration than is possible in the case of the sensitive emulsion itself, and a method of procedure adopted which would be quite out of the question in the dark room. If

the gelatine solution be made of double the strength required in the final emulsion, say forty grains to the ounce of water, it can be easily and quickly filtered before a clear, hot fire, through a thick flannel or felt 'jelly-bag,' which will clear it far more effectually from the usual mechanical impurities than any of the dark room expedients. If passed two or three times through the same filter, the gelatine will acquire a 'brightness' equal to the clearest collodion. The bromising salts and silver can then be added, previously dissolved in distilled water, and the emulsion made up to proper volume.

Since I wrote on the subject in the pages of the JOURNAL, I have succeeded in utilising the clearing powers of albumen for the purpose, and in some respects prefer that method to mere filtration. But it requires some care in order to ensure success; indeed, the employment of albumen for this purpose has been said to be impracticable on a small scale, though it really is not so.

The conditions to be observed are simple. Let about equal weights be taken of liquid albumen and dry gelatine, soften the latter and dissolve it, and at a temperature not higher than 120° Fahr. stir in the albumen previously beaten to a froth. When thoroughly mixed raise the temperature gradually, stirring well until it reaches about 140° to 145°, using the thermometer, of course, and then allow the whole to rest, still continuing the heat. Between 150° and 160° the albumen will coagulate, but in so fine a state of emulsification that it cannot be separated from the gelatine by filtration or other means, and consequently appears to have done more harm than good. If, however, the heat be continued until the boiling point of water is reached the albumen will be found to 'clot,' and if the solution be then passed through the filter bag, albumen and impurities together will be found to have been removed.

The proper filtration of the gelatine is, in my opinion, the first point in securing the finest lantern plates in gelatine; after that the preparation of a comparatively slow emulsion. Extreme rapidity is in my experience quite incompatible with perfect clearness of the lights, and I therefore say make a slow emulsion, never mind by what formula.

THE WAR CORRESPONDENT'S CAMERA.

By MELTON PRIOR (War Correspondent of the *Illustrated London News*).

SINCE writing the article in last year's Annual, I have been round the world, and my camera has been in almost everyday demand.

Now for the purpose for which I require photography the common everyday routine of the tourist does not answer; you have to unpack and erect your stand and undo your camera, and, in short, as the Americans say, you have to fix things up, thus causing a delay of about three minutes to take a photograph. My requirement is that the apparatus shall be suspended on my back in such a way that, like a binocular glass, it can be brought into use in a moment by turning it round, removing the cap, holding it square in the hand while directed at the object, and then touching a trigger by which the 'shot' shall instantly be fired and the subject thus secured, a couple of seconds being allowed for changing the plate. Few have travelled more than I, or so much, without realising the want of a machine which, especially when on the

war path, is capable of reproducing rare combinations of cavalry or infantry at the identical moment when required. Lord Hartington said in the House of Commons that 'he had no evidence to corroborate the accuracy of Mr. Melton Prior's drawings.' Now, supposing that, instead of having employed my pencil on the occasion referred to I had made use of a camera, there surely could then have been no question as to the position I occupied.

Another camera has just been completed for me by Rouch, and it seems to be the most feasible of all for the war correspondent. It fulfils the requirements I have spoken of in an admirable manner. The plates, one dozen in number, are packed in the camera under such circumstances as to be transferable from back to front in a few seconds.

QUACKS.

By William H. Walker.

There is a peculiar animal abroad not only in this but in other lands. He is indigenous to no particular part of the world, and his era began before the Flood. In all vocations followed by man—in art, science, politics, or trade—his presence is felt, at times patronising and bland, now kindly pointing out the one defect which others have not seen, or damning with faint praise the firstfruit offerings of some patient seeker after recognition.

No school of art, from that of Phidias to our modern Tadema, has quite satisfied his exalted ideal, while the realms of science only exist to enable him to demonstrate beyond dispute that nothing can be what it seemeth. If a politician, he is generally a self-sacrificing exponent of wrongs which do not exist, and a zealous advocate of reform, while he seldom suggests any adequate remedy. No tangible evidence exists to show that he ever possessed any actual knowledge or skill, either natural or acquired, entitling him to the position which, by a strange combination of circumstance and assurance, he has lifted himself into from the mire of obscurity.

Even in photography is he known, and always is he a bright and shining light. No process, however unique, is new to him, no instrument has ever been devised to meet the difficulties of the work he has in hand, no plate is quite sensitive enough, and, as for printing papers, they are all rubbish, absolute rubbish! The fact that he is sometimes found in trade does not militate against his undoubted purity of purpose, his sole object in life being to relieve photography from the odium of being a transitory art.

He has even been known, at great expense and sacrifice of valuable time, to publish and distribute gratis a series of 'Notes,' intended to elevate the waning taste for art, and to warn the innocent from the snares of those unscrupulous adventurers who presume to claim, by chance, those peculiar and rare qualities which are solely the properties of his wares. This patron of the art is frequently found in high places; no council is quite complete without his guidance, no award valid until he is consulted, and his ever-generous offers to fill any gaps upon the exhibition walls mark him as a man that surely would be missed, and, as for questions, well, really, such questions as he asks are puzzlers to be

sure! They remind one of the proverb, 'Birds of a fweather! Now wha-what nonsense! How can a-a bird f-fly with *one* fweather?'

Sometimes he is scientific, and, all joking aside, he has frequently proven with his horrid chemicals how absolutely transient all mundane things are. Sometimes he is literary, and has even been known to edit a photographic paper, in which position only an ambitious man's real qualities can come to the surface, and breadth and scope be given to his varied talents, for we all know an editor must know of what he speaketh, and that no better evidence of his erudition could be cited than the fact that he is equally versed upon artistic, chemical, mechanical, photo-mechanical, not to speak of politico-religious or economic matters, and as for any social scheme or form of government, none has to this date met with his approval. His learned dissertations in the leading dailies upon the last Exhibition, in which he enlarges so fully upon the merits or demerits of the exhibits, marking this one up and that one down, and always giving his *reasons*, help us to realise our true position and correct our faults; therefore let no thoughtful photographer, not quite sure of his own opinions, venture upon any process untried by time, or presume to offer for exhibition any picture until it has been submitted for the approval of this undoubted judge, else he may find that the tone is simply frigid, or the subject quite indecent, or, perchance, quite too large, you know.

Now take my advice, make and cultivate this gentleman's acquaintance, for you see he is not only a help, but an actual necessity to the art.

BLISTERS.

By G. H. E. Sutton.

In The British Journal Photographic Almanac for 1885, I was permitted to have my say upon the subject of blisters on albumenised paper, and last year Mr. Kane supplemented that article, together with a previous one of his own (in 1883), throwing some most valuable light upon the chemistry of these oft-recurring pests, and I purpose in this paper somewhat to retread the same ground, as the subject seems to be very little generally understood, and the disease to be practically as rampant as ever.

I am firmly of opinion that so long as the paper is lightly salted, blisters of one kind or another will not fail to put in an appearance. I do not say that a heavily salted paper would not blister, but I know from an experience of twenty-five years that when it was salted with from twelve to fifteen grains per ounce—the silver bath, of course, being proportionately strong—they were but rarely met with, and the albumen was more firmly coagulated and incorporated with the fibre of the paper. As it is hopeless to expect to return to those halcyon days, we must beard the lion in his den by battling with the evil until, haply, some fortunate discovery will give us power over the enemy, and enable us to set him at defiance. Let us hope that it may be so.

In the meantime the surest preventive I have found, and am enabled to offer, is to proceed as follows:—Keep a small quantity of undissolved camphor in the sensitising solution, which must be kept up to its fullest

strength, and see that the paper is stored in a perfectly cool room both before and after exciting, drying it as quickly as possible after the latter operation. Let the washings be expeditiously performed, especially the first two or three changes; do not wait to see how milky the water will become. Let the last wash have as much salt in it as will give the water a fairly good taste of its quality, finally changing into fresh water ready for toning. Reserve this saline solution, into which transfer the prints from the toning bath; and let the toning, and indeed all other operations, be as speedily executed as possible. Do not make the hypo bath stronger than two ounces to the pint of water, and put in it a handful of salt, and one or two drachms of L. ammonia. When the fixing is complete, put the prints one by one into another solution of salt, turning them over for five or ten minutes, and then into a moderately weak solution of alum, finally transferring them to the washing trough. All this may appear to be somewhat troublesome, but it is very simple, and the ingredients may easily be stored for immediate use in saturated solutions; but herein, in my own experience, lies the greatest safeguard against the evil under consideration.

But I must add that one of the forms of blisters, those abnormally large ones, say, of the size of a shilling or a half-crown, and where there are, perhaps, but one or two upon the whole sheet of paper, and some sheets without one at all, are the result of the paper being desiccated by lying in a heated room previously to being sensitised, whether the heat proceed from a fire or from the rays of the summer sun. This fact I have conclusively proved. Moral: Store all albumenised paper in a perfectly cool, even if not slightly damp room, and never lay it upon the silver bath in any other condition. This being premised, the monstrosities spoken of should never put in an appearance.

NOTES ON DEVELOPMENT FORMULÆ.

By Francis T. Beeson.

The subject of development is always one of interest to the photographer, so perhaps a few notes from my experience this year may not be out of place.

First, I would add my protest to that of others against the unscientific way in which formulæ for developers are generally published both by plate makers and contributors to the journals. They are generally given in such a form that anyone wishing to make up a small quantity of developer must take the trouble to make several calculations by arithmetic, and, what is of more importance, if he wishes to know what quantity he has used with a certain plate to get a certain result, he has to go through the same tedious process, and more especially does this apply where he wants to make variations in his developer for different exposures and different subjects.

It is now several years since Colonel Stuart-Wortley, in a paper entitled 'Scientific Development,' advocated the use of ten per cent. solutions of pyrogallol, bromide of ammonium, and ammonia, kept separately, so that the proportions of each in the mixed developer could be varied at the will of the operator, according to the exposure, subject, and the result

desired. This was a step in the right direction, but little seems to have resulted from it, and ammonia has been largely replaced by the alkaline carbonates.

With regard to a preservative for the pyrogallol solution, I have found that meta-bisulphite of potash (introduced by Messrs. Mawson & Swan, and recommended by Mr. Andrew Pringle) to be very satisfactory, and far more convenient to use than the ordinary sulphite of soda, to say nothing of its being more economical. It is itself an acid salt, and does not require the troublesome process of acidifying and testing with litmus, and gives the advantages of sulphurous acid without its variations and suffocating fumes. It is also soluble to the required extent in *cold* water, though I strongly recommend the use of water which has been boiled, if distilled water is not used.

I was desirous of trying one of the formulæ where the alkali used was a mixture of the carbonates of soda and potash, and wished to be able to vary the proportions of each, and also to be able to use ammonia in conjunction with the carbonate of potash, or to use either alone. The following was the plan I adopted for making and keeping my solutions.

I dissolved half an ounce, avoirdupois, of meta-bisulphite in about 7 ounces of water, and added 1 ounce of pyro. I then added water carefully to make up 9 ounces 1 drachm. I then in another bottle dissolved 1 ounce, avoirdupois, of bromide of ammonium, as supplied by the dealers, and dissolved it in a small quantity of water and made up the solution to 9 ounces 1 drachm. With the carbonates I took 2 ounces, and made up the solutions to the same quantity in separate bottles. I then took 1 fluid ounce of the strongest ammonia and made up to 10 ounces with water. I also made a solution of meta-bisulphite in the same proportion as the bromide, so that when using the carbonates I could add a larger proportion of the sulphite. I then had for all practical purposes with our present graduated measures ten per cent. solutions of pyro, bromide, ammonia and meta-bisulphite, and twenty per cent. solutions of the carbonates of potash and soda. I could then make up any desired formula and vary the proportions of each constitueut of the developer as I pleased, always remembering that each fluid drachm of my ten per cent. solutions contained 6 grains, and each drachm of the twenty per cent. solutions double that quantity.

After some few trials I found the following formula to work well for the plates I was using (a cheap brand), the subjects being landscapes :—

Pyrogallol	3 grains.
Meta-bisulphite of potash	3 ,,
Bromide of ammonia	¾ grain.
Carbonate of potash	12 grains.
Carbonate of soda	4 ,,
Water to make	1 ounce.

In conclusion, I would say that the influence of a quantity of solution in development as mentioned in THE BRITISH JOURNAL OF PHOTOGRAPHY some time since is a very useful power in the hands of the photographer, especially in the case of interiors. I prefer to start with a good bulk of solution, and then, if I see the image wants vigour, I pour off some of the developer and finish with a smaller quantity.

HINTS FOR THE DARK ROOM.

By Sir David Salomons.

Buy the dry plates in the winter for use during the following summer, and thus ensure satisfactory results. Keep all plates in tin boxes, which are sold nearly everywhere; they are proof against damp and light-tight under all conditions, which cannot be said of wooden and other boxes. They have also the advantage of taking up very little room, and can be opened easily in all weathers.

Let the dark room always be warm, never below 60° Fahr. This may be done at very small expense with the gas stove called 'Lux Calor,' which requires no chimney, and gives off no bad fumes, such products being dissolved in the condensed water collected in these stoves.

Have no hyposulphite of soda in crystals, but keep a solution of 1 ounce hypo to 1 ounce water, which is practically a saturated solution. Dealers will sell it made this way. Some processes require 1 to 4, others 1 to 5, &c., so in a moment the required solution is made without recourse to a number of bottles. The same may be said of oxalate of potash, the stock solution being 3 ounces water to 1 ounce oxalate of potash. The chloride of gold stock should be 1 grain to 1 ounce. A sulphate of iron stock solution might also be made; others also if desired. By this method a number of processes may be worked without confusion or taxing the memory, provided that on the wall is hung cards with the instructions applying to the various processes. These cards are made by mounting the directions sent out by the makers on cardboard, then size and varnish them, and attach a ring, such as are used by shopkeepers to hang up tickets on their goods. By this means the instructions are always at hand, and not liable to become soiled by touching with wet fingers. Remember to have extra screens to the windows from May till September; these can be made of red tammy or paper stretched on frames and buttoned into the window frames, and thus be removable.

It is well to have all hypo dishes of a special material, say *papier-mache*, by this means no mistake can ever be made.

A Fletcher's radial burner is by far the best for heating liquids, varnishing negatives, &c.; it is handy, and requires no stand for the pots or dishes. For platinotype these burners are invaluable. For boiling, making up solutions, &c., where hot water is required, there is no better way than to use a block tin saucepan with a loose porcelain inner pot, such as are sold for boiling milk. Large quantities of solution may be made up in this way without contact with metal, and the advantage of a block tin outer case is the freedom from rust. These vessels may be obtained to hold from 1 pint to 2 gallons.

When a plate is examined during development by lifting from the tray to look through it, lines are often caused by the developer running downwards. This evil may be avoided if the plate is continually turned when upright, and on returning to the tray flow the liquid in all directions.

The best way to varnish with spirit varnish is the following:—The room must be about 65° Fahr.; warm the plate as usual and flow the varnish. Do not rock the plate, but place it as held when draining in a rack. After two or three minutes the crapeyness will disappear; it must

then be heated again as usual. This way has two advantages: firstly, a more glassy surface; and, secondly, no chance of 'firing' the plate, which often occurs if warmed directly the varnish has run off.

For solutions constantly required, such as hypo for fixing prints, acid solution for platinotype, &c., all the trouble of measuring large quantities may be saved by having a few large spare bottles, in which the quantities have once and for all been measured off and scratched with a diamond upon the bottle, so that it will in future only be necessary to fill with the various liquids up to the scratches.

In making starch for mounting prints the process should be stopped the moment the liquid clears; if continued, much of the sticking quality will be lost. There is no better way of making it than in the little tinned copper sold with the 'Pendu light,' or a glue pot. Albumenised prints should be rolled up face outwards to prevent the surface contracting.

DARK-ROOM ILLUMINATION.

By Max Boelté (New York).

I just have returned from an extensive trip through the States which surround the group of lakes Ontario, Erie, Huron, and Superior, and have had often and repeated occasions to visit the studios of photographers of much fame, and almost everywhere I have been surprised by the fact that all of them are labouring under really great and disagreeable disadvantages, as far as the illumination of their dark rooms is concerned. Some of them use two, yes, even three, sheets of ruby glass, of which generally one sheet is of the so-called double-flashed ruby pot glass; others use combinations of yellow and ruby, or orange and ruby; and none of them has the sufficient amount of light to be at ease in his dark room. My remarks about a scientific illumination often met with a peculiar result, *i. e.*, an expression like that of St. Thomas's appeared on their faces, and words as, 'Yes, that seems to be good and must be an advantage,' were the only result of my hard endeavours to convince them!

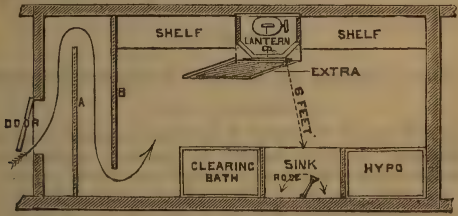
I am fully aware that in England the far greater part of the photographers have dispensed already long ago with the dark ruby illumination, and have adopted yellow light; but as your Almanac is such a welcome guest on this side of the Atlantic, I hereby take the liberty to write you about my experiences, results, and reasons which engage me to advocate the use of yellow light in the dark room; and I hope that it may be of benefit to one or the other of our brotherhood.

First of all, I avoid to have daylight, for its intensity fluctuates enormously, and as long as a dark room with daylight is used the operator has to interrupt his work as soon as the light becomes too dim. An artificial illumination, may it be gas, electric, petroleum, or oil light, gives always the same amount of light, *i. e.*, for each kind used, and, further, enables the operator to work at any hour of the day—early morning, evening, or even night! Furthermore, it facilitates the estimation of the negative under development, and the operator becomes far more expert and sure of his work.

All this has been the subject of many a discussion and lecture, but there is still something more which is worth to be considered, and that is, the application of the simple opti-physical law. The power of the

light, as is well known, increases or diminishes in the relation of the square of the distance, or, in other words, the light at 3 inches from the burner is in the relation of the square of three, so much stronger as it would be at the distance of 9 inches multiplied by this number. Now, if we have an illuminating power, and we place a screen, or non-actinic medium, at 3 inches from this light, the power of the (transmitted) rays would represent $3 \times 3 = 9$; meanwhile, when we place a screen at the distance of 9 inches, the power of the rays would be represented by $9 \times 9 = 81$! In accordance with the above quoted law, it is evident that if a light would be perfectly safe to work a plate of a certain sensitiveness at a distance of 9 inches, it would not be at the distance of 3 inches.

My dark room, to use the expression of many a visitor, is 'flooded with moonlight'—that is, there is so much light that I can read a periodical without any effort, and, of course, I can find any bottle, holder, &c., of which I might be in want. The following little diagram will illustrate the arrangement of my dark room and lantern, and will be readily understood :—



Dimensions of lantern, 15 inches high; each pane 6 inches by 12 inches. Burner from screens, 8 inches. Distance from lantern to sink, 6 feet. Arrow, indicating way of entrance to dark room. Extra, extra screen hinged to lantern.

As will be seen by the diagram, the entrance to my dark room is such that at any moment I can get in and out without fear that light might get into the room, for the light which enters through the open door is cut off, first by the screen A, and next by the screen B, which both are, of course, perfectly light-proof and well fitting to the walls and floor, &c. My lantern has its place opposite the operating table, where the sink, hypo and clearing baths are; and there is a distance of fully 6 feet between the screen of the lantern and the closest border of the developing table. My lantern is *home made*, of wood, and its construction is very simple. It has a double bottom, provided with large air-supply holes, arranged in such a way that no downward reflected rays can find their way out! A so-called locomotive funnel produces a strong air draught, and, besides, there are in the double top also air outlets arranged in same way as the air inlets of the double bottom. A kerosine lamp, with a flat burner $1\frac{1}{2}$ inches, gives a splendid bright light. The translucent screens are made as follows :—The front pane holds three layers of sunflower tissue, and the other two panes hold only two layers of same paper

between two glass plates. Although my experience is that no fogging takes place whilst developing or handling a rather sensitive plate at the distances of four or even three feet from my lantern, I still have judged it prudent to place an extra screen of one thickness of yellow paper in front of the lantern. This screen is hinged to it, and easily can be lowered or raised at will by means of a cord running over a pulley. For placing plates into the holders, dusting them, &c., I raise the screen, and I still have abundant light to see well. When I have a plate which requires a slow development, or when I have highly sensitive plates, I always have the screen before the lantern, but as soon as convenient I lower the screen, and work proceeds in the most easy manner.

The power of the light at the sink is represented by the following figures:—Distance of burner to screens, 8 inches $= 8 \times 8 = 64$; distance of screens to front of developing table is 6 feet $= 72$ inches $\times$ 72 inches $= 1684 + 64 = 1748$.

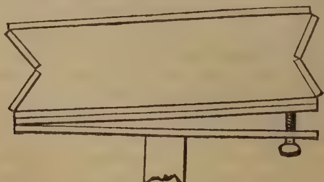
Let any one who likes to work with ease and comfort try this arrangement, and I feel sure that he will like it.

In order to be absolutely sure and always on the 'right track,' it is only necessary to substitute every five or six months fresh sunflower paper between the glasses.

EXTRA HEIGHT TO STUDIO CAMERA STANDS.

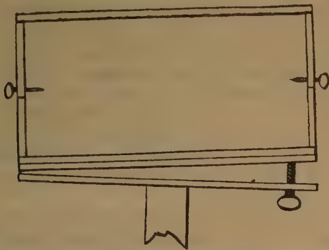
By Edgar Scamell.

In taking vignette heads of sitters it is often desirable that they should be taken standing. If they happen to be even moderately tall, the ordinary studio stand which places the lens about 5 feet from the floor will be too low. By the following arrangement the camera can be raised an extra $\frac{3}{4}$ foot, which will, as a rule, be found quite enough for any one but a giant. Supposing the top of the present stand to measure 16×10 inches, screw four strips of wood (so as to form an oblong), each $\frac{1}{2}$ inch wide by $\frac{1}{2}$ inch thick, on the top; two of these pieces must measure 16 inches and two 10 inches, and the corners will have to be mitred. Next take four pieces $\frac{1}{2}$ inch thick, $4\frac{1}{2}$ inches wide, and 10 inches long, and one piece 16×10 inches, and screw two pairs of hinges to each joint of these and to the top of the stand, so as to allow it to be raised up as an oblong box without sides, or folded down to four thicknesses of wood—thus when only half open.



Now to support this when open take a piece 15×9 inches and hinge it on to the original top, so that it will fold down inside the four strips and when raised up will hold out the hinged ends, through which two

thumbscrews may be screwed into this supporting piece, so as to clamp the whole firm, when it will present the appearance as under (⅛ original).



Of course as all stands are not the same size, the figures given will have to be varied to suit in many cases.

EXTEMPORISING DARK ROOMS.

By H. Valentine Knaggs.

The successful operator has necessarily to be a man of ready resources, and must, like a general in the field, be able to take in his surroundings at a glance in order to overcome obstacles as they occur. In no part of our mechanical work are we called upon to exercise our ingenuity to such an extent as in the matter of fitting up a dark room for temporary use. This is especially the case with the photographic tourist, who, travelling as he does from one portion of the country to another, is often compelled to change or develop his plates under circumstances of difficulty and trial. He must either take with him a changing bag or box, or some portable apparatus, which can also be used for developing (these are at the best cumbersome and add greatly to his *impedimenta*), or, in order to accomplish the same purpose, must provide himself with a small portable lamp and make use of any suitable room when the hours of darkness have set in. The latter method is the one I usually prefer, since, to say nothing about the small space that one of these lamps occupies, it is, according to my experience easier to work, gives us a perfect dark room, and enables us to have plenty of fun for our money.

At Home.

For day use it is a very simple procedure to rig up a good and efficient dark room. I am not an advocate for the habitual use of small linen closets, cupboards, and confined, ill-ventilated places of any kind as dark rooms, unless, perhaps, they are used for the sole purpose of changing plates. For developing and other manipulations it is generally preferable to select an ordinary room of moderate size—in which the air can circulate freely—and block out all extraneous light except from one window. Over this window a screen of black cloth somewhat larger than the entire window itself is placed, and retained in position either by means of a few tacks or by a few hooks and eyes, so as to effectually exclude every ray or

beam of white light. Then a rectangular aperture of suitable size is cut in this screen and an elastic band stitched into its free border. Into this aperture is next inserted a wooden frame holding ruby glass or fabric, and this frame having a groove cut round is retained in position by the elastic band. This makes a capital temporary dark room, and similar frames containing actinic or other non-actinic mediums can be substituted at will. By attaching the elastic band round a camera of full extension, we can also make enlargements with the greatest of ease by daylight. The screen should not be too taut, and when it is also to be used for the purpose of making enlargements it is desirable to sew on to the screen an armhole likewise protected by an elastic band and rendered light-tight, in order that those parts of the apparatus outside the screen may be properly adjusted as occasion requires.

Where it is inconvenient or impracticable to use an ordinary room for photographic purposes, I have employed with advantage, both for changing and developing plates, the form of portable dark room recommended by my friend Mr. C. C. Hodgson, in the ALMANAC of 1886. It is remarkably comfortable to work in, and is, to my mind, the next best substitute for an ordinary room, since it can be made perfectly light-tight, and at the same time, unlike the generality of cupboards and linen closets, permits of free ventilation.

For night use any suitable non-actinic lamp can be used in an ordinary room, but it is of course a necessary precaution to draw down the blinds and exclude the entrance of extraneous light from any quarter from which it is likely to come.

ON A TRIP.

It is principally during our travels in search of the picturesque that the real difficulty of extemporising a dark room makes itself felt, and it will therefore be useful to refer briefly to a few of the points relating to this matter. During my roamings with the camera I have invariably used a small pocket lamp, which has always proved efficient. It should be made of ruby fabric and not of glass, which in the event of fracture or breakage renders the apparatus worse than useless. Many of the folding lamps now in the market are very compact, take up but little space, and serve every purpose. With a lamp of this description, and a little ingenuity, it is generally possible to overcome all difficulties.

Having taken up our quarters for the night, we proceed to block out any actinic light that is likely to prove detrimental from our room, and then, lighting our lamp, proceed to work. In the hotels of the Continent and Switzerland the closing of the outside shutters (*persiennes*) will usually suffice, but should any bright lights either from the street or from opposite buildings happen to be shining directly into our room, we must, in addition, pin up a blanket or focussing cloth so as to exclude it. In America we sometimes meet with insuperable difficulties in this way, and occasionally get the full force of an electric arc light shining directly upon us from the street. Another source of trouble in American hotels is the small rectangular window placed above the door, which serves the purpose of ventilation and of dimly illuminating the room during the night. Over this window we can pin a focussing cloth, but where an electric light is shining brightly through our windows, there is nothing for it but to light the lamp and change our plates under the table

or the bed, after previously surrounding it on all sides from which the light is likely to penetrate by means of anything that comes in our way.

In one instance of this kind I succeeded perfectly in changing my plates underneath the bed by regularly surrounding it, as if to resist a siege, with pillows, blankets, a table-cloth, a few coats, a mackintosh, and other odds-and-ends, until it was quite light-tight. The construction of this strangely improvised dark room was a source of great gratification to me, but I am rather inclined to think that if the proprietor of that hotel had seen me in the act of changing my plates he would have thought a great deal.

At sea the ordinary cabin or state room will make a capital dark room at night time, by means of the ruby lamp, and many cabins can even be used for the same purpose during the day by attaching some ruby texture over the scuttle or porthole and excluding actinic rays from other quarters.

When using a portable lamp, do not forget to take a spare quantity of ruby fabric in case the substance should by accident catch fire. With care, however, this ought rarely to happen, but it is a wise precaution to be prepared for an emergency of this kind.

I have converted all kinds of places into temporary dark rooms during the hours of darkness by means of my little folding lamp—I use Redding's by preference—and have never yet found any bedroom or other room in an hotel or elsewhere which could not, by a little manœuvring and care, be used with perfect safety for changing plates. I doubt not but that others who have done the same thing will agree with me in bearing out this statement. One might almost imagine that the mind of the immortal bard himself was running on the subject of dark rooms when he tacks on the following verses to a speech of unusual bloodthirstiness :—

'Nor heav'n peep through the blanket of the *dark*, to cry, "Hold ! hold !"'
Macbeth.

THE KEEPING QUALITIES OF DRY PLATES.

By A. L. Henderson.

This is a subject that I am afraid your valuable space will not admit of an exhaustive treatise. Nevertheless, it is one of great importance. From observations it would appear that dry plates deteriorate in various ways. I only intend to point out one or two likely causes. The more rapid plates do not keep so well as slow ones. Probably the bromide of silver is in a condition more like free silver and easily affected. Plates that have gone wrong in this way have been completely cured, or, rather, have given perfect negatives by placing them in the ammonia and bromide solution (after exposure), and before adding the pyro. Imperfect separators, *i.e.*, paper or cardboard, is a dangerous thing to use. I much prefer placing the plates face to face, or separated by tinfoil. The pressure and chemical action will cause a darkening of the part in contact that will soon spread into the middle of the plates, and no dodging that I am aware of will remedy this. Another defect, if I may term it such, is the ripening action that goes on with some plates. This is only a serious matter when plates are exposed at various times and developed a long time after. When development goes on daily it is of little consequence. The exact cause of this gain in rapidity is difficult to explain, but I have a strong suspicion that the plates may have been packed away on damp days. I

have noted this when I have had several coatings from a large batch, some of which were packed away on rainy days. I have not noticed so great a change when a small amount of free bromide and nitrates were added to the emulsion. A box of plates, coated and packed away in June, 1884, in a grooved tin box, which have been cadged all over the United States, has just been opened, and when tested have been found to have doubled in speed and lost none of their quality, except at the top end, and that evidently has been caused by a pad of brown paper put to keep the plates from shaking. I have lately introduced an antiseptic, which I hope will prove of great value. Suffice it to say, that it has stood a two years' test admirably, of which more anon.

THE ENERGY OF ACCELERATORS IN DOUBLE OXALATE DEVELOPMENT.

By A. Treyer Evans.

There has arisen at home and abroad a deal of discussion as to the action of accelerators in the development of gelatine dry plates by the iron method, and really nothing has been done even to roughly compare their accelerating energies; to this end I have craved, and not indeed without some useful results. To form a relative estimation of the energy of accelerators we must not appeal to the sensitometer to give us its computations, as accelerators cannot 'urge on the numbers' by some magic essence that some scientist of late would have them possess; but by a photometric examination of the density of the deposit I have met this difficulty with some little success. The method I adopted is somewhat novel, so it may be of interest if I relate the steps taken.

A gelatine dry plate was exposed (unscreened) at a distance of two feet from an Ozokerit candle for five seconds, the centre being in a direct line with the candle flame, and in a perfectly vertical position, so that it obtained an absolute equable exposure superficially. It was next laid face downwards on a cutting board, and divided into five strips across the plate. Four of the strips were then marked with the symbols of the solutions into which they were afterwards immersed, and which will presently be described, so that no mistake could occur, whilst the fifth strip was marked 'normal.' Four separate solutions of $Na\,Cl$, $Na_2\,S_2\,O_3$, $Na_2\,SO_3$, and $Mg\,SO_4$ (1 to 1000), in four separate beakers, were prepared, every care being taken in weighing and making the solutions so that absolute accuracy might be obtained. Each strip in its respective beaker was allowed to remain three minutes, taken out, placed upon several thicknesses of bibulous paper, and afterwards the back of each carefully wiped. The one marked 'normal' remained *in statu quo*.

The whole of the five strips were now placed in the developing dish, and the developer—double oxalate (1 to 4) containing three grains of potash citrate to the ounce, which addition I earnestly advocate—flooded over the whole. Almost simultaneously with this latter operation one of the strips instantly assumed a black appearance, which subsequently proved to be the one which had the preliminary wash of thiosulphate of soda, whilst the others grew visibly darker as development proceeded. Four and a half minutes, and the possibility of further development

seemed annihilated; so I washed and fixed in the ordinary manner, finally drying them in a warm cupboard after proper washing in running water for twelve hours.

All that remained now was to make a photometric estimation of the density of the deposit on each strip, so that any variance in the opacity of a developed strip which by reason of the developer's enhanced energy which ensued (due to the specific accelerator's action) could be examined, and compared in juxtaposition with any other strip which had undergone similar exposure, although primarily immersed in a different accelerator.

The results I obtained will be understood by the following diagram, the gradient indicating the intensity of the accelerator's action, the opacity of the deposit being a measure of their accelerating energy.

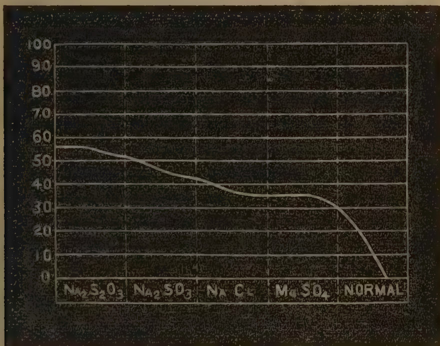


FIG. 1.

From the above figure it will be seen that thiosulphate of soda increases the opacity of the deposit by fifty-five per cent. We must not believe that this salt does reduce those haloid molecules that have not received the impact of light, but we may look for an increase in the opacity of the light-altered silver haloid upon development. It may be due to a blacker reduction of the silver particles that this intensity is gained, although the accelerator may assist in reducing adjacent molecules of the unaltered haloid, and so increase the number of silver particles vertically through the film.

Bodies that do the double duty of increasing the rapidity of development and the opacity of the deposit should be termed accelo-intensifiers, or some other kindred specific designation, in contradistinction to the now existing intensifiers which are applied subsequently to the development of the invisible image to 'build up' or alter the colour of the visible image. The latter agent's actions are visible, they produce visible effects upon visible silver particles, whilst the accelerator's work is not only to hasten development but also to augment the deposit's opacity, and its effect upon the image that rests *incognito* is invisible, although rendered sensibly visible to us upon development. Hence there is a great distinction between these two classes of would-be-called intensifiers.

ADDENDUM.

The photometer I used in these experiments I have made somewhat after the principle of Bunsen's; but instead of looking directly at the tissue screen carrying the grease-spot, I fix two mirrors which throw an image of each side of the grease-spot up towards the observer's eyes. In fixing the negative under examination to the one side of the photometer I employ two brass springs, similar in principle to the spring clip on the stage of a common microscope used for holding the slide *in situ*, so that the negative held by these springs can be moved to the extreme edges over the aperture, which is the inlet of light from one of the candles. The apertures (one on either side of the photometer) are made by piercing two holes respectively in two pieces of sheet zinc one-eighth of an inch in diameter. They coincide with the grease-spot on the tissue screen, so that a straight line drawn from one candle flame to the other would cut through the two apertures and the grease-spot. This is made by dipping a hot pin into the melted wax of a candle, and just touching the screen on either side. The spot may be reduced in size, although if much smaller than a pin's head it becomes difficult to work with. The following diagram will convey to the reader more precisely what the writer means.

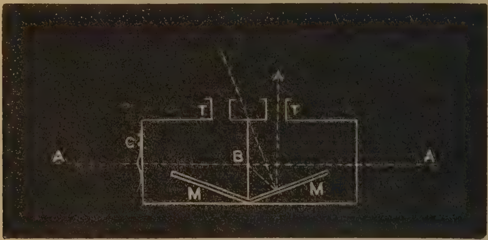


FIG. 2.

A A. Light from candles. B. Grease spot.
C. Spring clip for holding negative.
M M. Two mirrors. B. Also tissue screen.
T T. Two lensless tubes.

One important item about the mirrors:—They should be of the best plate glass and cut from the same sheet, therefore avoiding as much as possible any variance in the thickness and reflecting surface.

TRANSPARENCIES ON COLLODION EMULSION.

By WILLIAM BROOKS.

IT is now over twenty years since I first attempted to make lantern transparencies on collodion emulsion, and I at once saw how far superior the result was to the old wet collodion process, and from that time I have never altered my opinion. In the first place, the process is very simple and expeditious, and any variety of tone can be easily obtained, from a bright claret colour down to a warm or cold black; and for the reproduction of maps and line work it stands unrivalled. There

is one very great error that amateurs fall into, and professional photographers also, and that is, they use their alkaline developer the same as they use for gelatine plates, and, I need not say, get the very worst results. The developer for collodion requires a much weaker developer than for gelatine. In the course of twelve months I make several thousand transparencies, and I may say that I do not miss more than one or two per cent. of the plates I expose. There is one great advantage in using collodion, and that is, so much can be done to the image after it is fixed; for instance, a mere ghost of an image can be readily intensified up to perfect opacity, and in broad daylight, which cannot be done successfully on a gelatine film, and still retain bare glass in the high lights; then, again, if there is any trace of fog through over exposure or thinness of the negative, it can very readily be removed.

At the onset a great many make such a fuss about a substratum. My experience is that it is not required at all, and that any substratum is a sure cause of spots, stains, &c.; all that is required is a *good* edging of indiarubber dissolved in benzole, and to be adhesive the benzole must be free from fatty matter. I purchase my rubber from Messrs. Cow, Hill, & Co., of Cheapside, London; it is known as 'masticated rubber,' and it is prepared specially for dissolving; it is rather expensive, but a little goes a very long way. If my memory serves me rightly, I think about two years since I wrote an article in THE BRITISH JOURNAL OF PHOTOGRAPHY on this subject. This rubber solution must be as thick as treacle. An edging is put all round the plate about an eighth of an inch wide, and when dry the plate is coated, and care must be taken to coat the plate to the very edge and to the extreme corners, for if any place is missed the water, when washing, will get in under and make the film loose and cause trouble; but if the edging and coating be properly done, almost any force of water from the tap may be let on to it. But always keep the plate in a horizontal position, and by this means I never have a film give way.

If warm tones are required, a full exposure must be given—a short exposure gives cold tones. I always fix with cyanide of potassium, as I find if hypo is used it is difficult to tone, and still more difficult to intensify with pyro and silver. After the image has been fixed and well washed, should there be any trace of fog I remove it by flooding the plate with iodine water. To make this I dissolve about twenty grains of iodine in one ounce of alcohol, and keep it as a stock solution—it will keep indefinitely. I drop a few drops of this into about an ounce of water in a measure; if too much is added it will be turbid but clears again on adding more water. I must here add a caution. The compound tincture of iodine, as sold at the chemists, should *not* be used, as that preparation is soluble to any extent giving a clear solution, and if too much be added it acts with too much energy, whereas the turbidity before spoken of acts as a gauge, and is at once seen without measuring.

This dilute solution is applied to the plate, and if there is a part that requires clearing more than another, pour on and off at that part; the light parts after a few seconds will have a blue opal appearance. Wash the plate under the tap, and again flood the plate with the cyanide solution. A portion, if not the whole, of the fog will be removed; if not, repeat until the effect is gained. This can all be done in the daylight. It is an old method, well known to wet collodion plate workers. After

clearing, the image may appear too thin, *i.e.*, not sufficiently intense enough. This can be very easily obtained by using the following re-developer:—

Pyrogallic acid	30 grains.
Citric acid	30 ,,
Alum	30 ,,
Water	15 ounces.

This will keep good for a month or more. About two drachms of this is taken in a measure, and one or two drops of a twenty-grain solution of silver nitrate is added at the time of using and poured on and off the plate. The image will soon be found to gain in intensity; when sufficiently intense, wash well and place in a dish of clean water to soak for about a quarter of an hour. If the image be too red or warm in colour, it is placed in a very weak solution of platinum bichloride—about one grain to ten ounces of water will be sufficent; it will gradually change from red to purple and on to black. It must be stopped short of the colour required when finished, as it gets more black in drying. I must point out that it must not be supposed that it is possible, in starting with a black or cold image, that the toning solution will give it a warm tone; a warm-coloured image must be obtained by giving sufficient exposure, and if too red the platinum toning bath will modify that tone. Now should the toning be by accident carried a little too far, wash well and flood with cyanide solution, same as for fixing; the image will at once change again to nearly the same warm colour as before, and can again be retoned to the depth required.

This system is the same as practised daily by myself. I have written this by request, and I trust it may be of service to those who admire a good, rich transparency.

ON THE COLOUR OF GELATINE NEGATIVES.

By William Cobb.

It is astonishing and even amusing to find how varied and changeable opinions are with regard to the colour of gelatine negatives, for whilst there are many who, regarding the negative as only the means to an end, pay little or no attention to its colour so long as the end is satisfactorily reached, there are others who seem to attach a primary importance to it; but admitting, for the sake of argument, that it does possess an important bearing, the question naturally arises, What is the colour to be aimed at?

'Why, they are almost the colour of wet collodion!' is an expression, intended as a complimentary one, which we sometimes hear used when gelatine negatives are under examination. Now, considering there is as much difference between the colour of a good, old-fashioned, pyrogallic-developed collodion negative and a more modern iron-developed one as there is between the euphoniously styled 'beautiful steel grey' and the 'greenery yellowry,' as some one has facetiously put it, of the gelatine negatives, the phrase seems to me to be vague and almost meaningless.

I know very well that I am about to place myself in a perilous position, and to lay myself open to the charge of sowing the seeds of rank heresy. I will, however, risk that. Old collodion workers like myself will remem-

ber that in the palmy days of pyrogallic development, when the now defunct and almost forgotten nitrate bath was in perfect *rapport* with the collodion in use, the resultant negative used to call forth the then familiar expression, 'What a beautiful peachlike bloom!' but, alas! how degenerate we have become! A similar effect produced now on a gelatine negative, and what do we hear? 'What a beastly green fog!' Yet in ninety-nine cases out of a hundred the remark is applied where not the slightest amount of 'fog' exists. It is altogether a misnomer, and if I were a buyer of plates instead of the poor unfortunate maker that I am, that is just the kind of plate I should seek for; none of your clear glass in the shadows negatives for me. I maintain that if the steel-grey coloured, iron-developed collodion negative is to be the recognised standard of excellence, we are altogether on the wrong tack, for I believe it is an admitted fact that with the advent of iron developers for wet plates we gained rapidity of production at the expense of permanency and, may I not add, quality of results? It is often urged that the greenery yellowry colour, such as is produced on an extremely rapid gelatine plate with the pyro and ammonia developer, takes a much longer time to print than one produced with the soda developer. This, however, is an erroneous impression. I quite recently had an opportunity of testing this thoroughly.

I exposed a number of 12 × 10 plates at the Exhibition lately open in Pall Mall, and duplicated each exposure, giving the same time to each half. These I developed with the ordinary pyro and ammonia, the rest with the soda developer. The difference in colour was very striking: in the one case I obtained the often-admired steel grey or more nearly approaching to black, and in the other the sometimes-abused greenery yellowry; and I must confess to a little feeling of surprise when I found that the time occupied in printing the differently developed negatives was almost identical, whilst the resultant prints pointed decidedly in favour of the ammonia negatives.

One other instance I would refer to as proving the fallacy of green negatives taking a long time to print. I have by me one of a series of London views, taken during the last few months, which, if judged by its colour, would be almost universally condemned. The exposure was exceedingly rapid, and forcing the development resorted to in consequence; yet not only is it a negative yielding a really good print, but it is about the quickest printing one of the whole series.

JOTTINGS *IN RE* TONING AND HALATION.

By the Rev. H. B. Hare.

Nearly every particular connected with photography has been so exhaustively treated at various times by one writer or another, that it appears a difficult matter to find a subject which may prove interesting to the readers of the Almanac. But as our worthy Editor has asked for a contribution in the shape of a short article, I feel I must put on my considering cap and see what is to be done. Perhaps I may have a chance (a small one I fear) of succeeding, if I narrate some of my experiences during the past year on two points—first, with regard to the *toning* of silver prints; and, secondly, to *halation.*

First, as to toning. Now this I consider (and I have had some thirty

years' proof of my opinion) is one of the most teasing, if not difficult, items in our art-science that we poor photographers have to contend with. (And here, perhaps, I may be excused if I make a passing remark, that it seems to me utterly preposterous that any picture should be admitted at an exhibition as the *bonâ fide* work of the exhibitor and receive a medal unless, besides taking the negative, the exhibitor has printed, toned, yes, and mounted the picture himself). But to resume. I say difficult and provoking too; for what is more annoying than when having taken a lot of trouble to print some pictures *well*—screening, sunning, and one thing and another—to find the whole batch turn out a nasty dirty brown, or else a mealy, leaden colour? Now how is this to be prevented? I answer: First procure a good sample of paper, and *stick to it*—I do not care to have those papers which print a kind of purple, all-ready-toned (to all appearance) colour, for when placed in the toning bath it is almost impossible to judge *how far* the toning has actually gone on. I prefer a paper that after washing, and before toning, looks *red*, and then I know what I am about. Next, do not print, if possible, in *very hot weather*. I cannot tell the reason, but I never could get such good results in a hot, dry day, as I could in a cool or damp one. If you *must* print in hot weather, place the paper previously for a few hours in a damp cellar. Next, after washing your own hands *most carefully*, wash your prints in not less than five or six changes of water, and in the *last but one* put—if you are using ready-sensitised paper—a teaspoonful of bicarbonate of soda to neutralise the acid employed in preserving it. From the toning bath place the prints immediately for a few minutes into a bath of salt and water, and then again into plain water, fixing finally in tolerably weak hypo, say, five ounces to a quart of water. If you have judged the toning (which I prefer to be done with the acetate of soda) correctly, you ought to have a print of a pleasing rich purple colour, presuming, of course, that your negative is a fair one. It is somewhat laborious, but I always wash my prints, every one separately, under the tap *many times* during an interval of six hours, and then dry them off in two or three changes of clean blotting paper and iron them.

And now for my second point—halation. And when I speak of halation, I mean only as it refers to negatives of badly lighted interiors, as are some of our churches and other buildings. Now, of course, the first thing to do, however well coated it may be, is to *back* your plate, and for this purpose you cannot use anything better than a mixture of burnt sienna in powder with gum water to the consistency of cream, adding after a small quantity of methylated spirit—it is easily applied with a brush, and easily rubbed off again with a damp sponge. But even with this precaution it often happens that windows are blurred. Now I get over this difficulty by a little dodging in the developing, thus: I commence with a very weak developer, with *plenty* of bromide, and the *least possible* quantity of pyro; and immediately I see traces of the windows or other parts likely to suffer from halation, I pour off the developer and paint them over with a sixty-grain solution of bromide of potassium; then pour on the developer again; strengthen it with more ammonia (but still using the pyro *most sparingly*), and watch the detail coming out over the plate. Very probably you will have to apply the paint brush a second or even a third time; but eventually, if carefully treated, you will

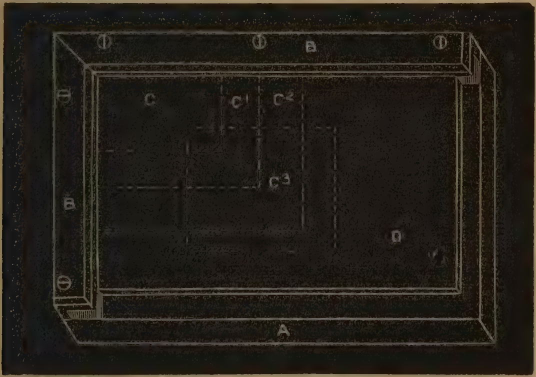
have your windows free from all blur, while the rest of the plate does not in the least suffer. I daresay some of my brother photographers to all this will say, 'Bosh!—I knew it long ago!' All I can say is—*I* didn't a year ago.

VARIOUS MECHANICAL DODGES.

By A. Kellar.

I have no doubt but that the purely mechanical part of photography deters many amateurs from devoting the time required to make a well finished picture, and that bad mounting, cutting, &c., spoils what would otherwise be an exquisite piece of work. The same remark applies to development, when slow development is resorted to. Should my communication be the means to help other amateurs on the way to success, I shall consider myself amply repaid for my trouble. 'Do unto others,' &c., is my motto, and in accordance with its teachings I send you the following dodges:—

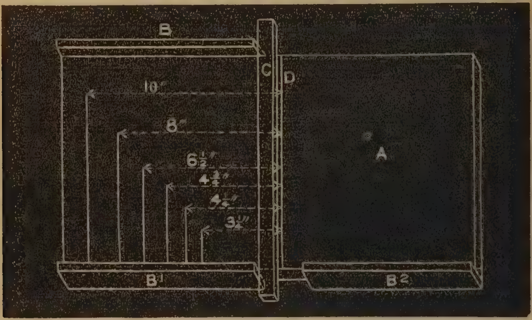
Mounting Board.—Consists of a flat board, A, upon which are screwed two strips, B B^1, at right angles to each other; each of the strips has a rabbet cut out of the under side about ½ inch deep, so as to allow the glass, D, to slip under. On this board a piece of paper can be pasted, on which the sizes of the mounts should be marked, C C^1, &c., care being taken that one edge and the bottom comes exactly under the edges of B B^1. D is a piece of glass which can be moved to and fro in the rabbets.



To start mounting, have the print's surface dry, put it on an old negative, face down, and paste; then put it on the glass D, still face down, as near as possible to the lines. Move the glass till the print shows an equal margin all round the lines, then take the mount and keeping it against the edges B B^1, press down, and, if care has been taken, you will have a perfectly mounted print. Keep the glass dry and you will not damage the most delicate mount.

Glass-cutting Board.—A is a flat board, on the edges of which are

screwed the projecting ledges B B^1 B^2. C is a piece of wood bearing against the ends of B and B^1 and which forms the straightedge for the cutter or diamond. D is the line which the diamond will make when



held against C. From this line the size of the plates is set out and marked on the board, or a stop fixed, and by two cuts you have a glass exactly square, provided the board has been made square in the first place.

Printing Frames.—A simple improvement consists of two pieces of zinc cut out as per shaded part in the drawing. Mark the side of the frame where the flaps join at the hinges, make a saw-cut in the side of the frame, and drive the zinc pieces in tight. The zinc strips will come

between the joint and prevent any movement of the flaps. The stops at one end of the frame will have to be knocked out, so as to slip the negative into position.

Cutting Glass.—I suppose most of us know the bother in getting hold of a cutting-glass and placing it in position. Well, then, stick an empty thread bobbin or a cork on the glass with elastic cement, and your trouble will vanish. Of course, I only use the knife when cutting.

View Finder.—Is simply a small box, either of metal or cardboard, with one open end. This end and the length of the box should be a fractional part of the lens focus, and the size of the plate, say $\frac{1}{8}$. In the closed end is cut a hole about $\frac{3}{8}$ inch diameter. On holding this end to the eye you can see all which will be shown on the ground-glass—the one I have is for 9-inch focus ($7\frac{1}{2} \times 5$), is strongly made, and only weighs three drachms, can easily be carried in a pocket, and is always at

hand to see if a 'bit' can be taken in. Many a time it has saved me the trouble of unpacking.

Rocking Machine.—I have a water wheel in my sink supported on two standards. On this wheel I have a crank fixed, connected to a bell-crank (supported by bearing); this is, in its turn, connected to a carriage resting on four wheels. Over the wheel I place a water tap, or piece of tube, which will discharge its water into the buckets of the wheel and by its weight set it in motion. When the water is turned on, the developer is carried from end to end of the dish, and slow development is deprived of its terrors. I have left an under exposed plate in for thirty minutes and found it going whenever I had a look at it. This machine can also be used for toning and fixing prints—keeping them in constant motion and no handling.

COMPRESSED GAS IN CYLINDERS.

By G. R. Baker.

The use of compressed oxygen gas is now becoming so popular, and the question is so often asked, 'How much gas is there left in the cylinder?' that it may be useful if I can say a little about the subject.

In the first place, it is necessary to know the cubic contents of the vessels holding the gas; that is, how many cubic inches of air or water it would contain in the ordinary way. Water, as most people know, is practically non-elastic, for it can only be compressed by the atmospheric pressure to about 46½ millionths less than its original bulk; hence, if we know how much a vessel will contain of it we are also aware how much gas or air at ordinary pressure it will contain. If the vessel is strong enough, gas or air can be compressed into it by powerful pumps, so that it contains more than 100 times its original bulk, and a vessel so charged is stated to contain 100 atmospheres (or more, as the case may be). An atmosphere has practically a pressure of 15 pounds on the square inch—being in reality 14·71 pounds at sea level, with the barometer at its average height. As this atmospheric pressure is exerting itself on everything animal, vegetable, and organic, it is only when a vessel or cavity is exhausted of air that this great pressure is felt, as instanced by the difficulty in removing the bell of an air pump after the air has been withdrawn. When a quantity of air is forced into a vessel equal to what it already contains, then the pressure exerted on the vessel from the inside is equal to that of the atmosphere, viz., about 15 pounds per square inch. For magic lantern and chemical purposes iron and steel cylinders are charged with oxygen or hydrogen gases, the iron being generally filled to a pressure of about 30 atmospheres, and the steel 110 atmospheres. As the latter are not only stronger but lighter, and contain three times the amount of gas for same bulk, they are now fast superseding the iron.

The capacity of the iron cylinders, which are commercially made in two sizes, are about a quarter and a half of a cubic foot respectively; hence, if the number of atmospheres the vessels are known to contain is divided by 4 or 2 the amount of gas in the vessel or cylinder is known, and, assuming it to be 30 atmospheres, it is 7½ and 15 feet respectively. Supposing the cubic contents of the cylinder is not known, it may be

found by multiplying the length by the square of the diameter, and dividing it into a cubic foot, or seeing what proportion it is of one. Then, taking the relation of a cylinder to a cube by table area of a circle to diameter 1 = ·7854.

I will take the ordinary stock steel small size cylinder, holding about 10 feet of gas. Its internal measurement is about 15 inches long and $3\frac{3}{4}$ inches diameter, or, put in decimals, 15 and 3·75 respectively. If the 3·75 is squared and then multiplied by 15, the answer would be contents in cubic inches if rectangular in shape instead of cylindrical; but as the latter, the proportion of ·79 to 1 is taken, hence the previous result, 210·7875 × ·79 = 166·5 cubic inches, which is equivalent to rather more than ·1 of a cubic foot. To know the contents of gas in the cylinder, multiply the area by the pressure in atmospheres as shown by gauge, viz., 0·1 × 100 = 10 cubic feet.

The pressures of 30 to 100 atmospheres are altogether too high for use with the limelight for ordinary optical lanterns or experimental work, so it is usual to fit very carefully-made valves to the gas cylinder to check the rush of gas, so that nothing like that pressure may be exerted on the tubes and jets. 12 to 16 inches of water pressure is quite sufficient for all ordinary purposes, and this is the pressure to which the more recently made patent automatic regulators are set.

When it is stated that 1 foot of water has a pressure of 7 ounces to the square inch, it gives some idea of the enormous difference compression makes—a bottle containing 110 atmospheres having a pressure of 1650 pounds per square inch. One atmosphere pressure will raise a column of water 33 feet.

Another method of knowing the amount of gas in a vessel is by weight. If the cylinder is carefully weighed before being filled and again afterwards, it will be found to be proportionate to 1 cubic foot weighing 62·3206 pounds avoirdupois.

To ascertain the pressure in atmospheres it is necessary to employ a pressure or vacuum gauge, and some are specially made for the gas cylinders showing pressure up to 150 atmospheres. It is, therefore, only necessary to screw these on very tightly to the cylinder, and gently open valve to full extent. The amount of gas in cylinder will be known by multiplying the number of atmospheres shown on the gauge by the decimals representing the cubic contents of cylinder, viz., 0·1 or 0·21 respectively for the 10 and 25 feet cylinders, or the fraction of the foot can be divided into the number of atmospheres: for instance, $\frac{1}{10}$ with the small one, and $\frac{1}{5}$ with the larger (25 feet) cylinder.

RENOVATING FERROUS OXALATE, AND BACKING PLATES.

By R. C. Phillips.

I have succeeded in renovating ferrous oxalate developer by adding a few drops of sulphuric acid and two or three scraps of granulated zinc. Of course there will be a limit to this treatment, which I have not yet reached, so cannot indicate it. Too much zinc might, perhaps, cause a replacement of zinc for iron in the oxalate, and so defeat the end in view.

Backing plates with ivory black, gum, and glycerine, proves of great

use, but whether through purchasing a bad sample of ivory black, or from any other cause, I find the paint gritty and somewhat weak. I now use *drop black ground in water*, and make up as follows:—Dissolve in two ounces *cold* water one ounce gum arabic. Add a mixture of one ounce glycerine and four ounces water. With this work up half a pound of *drop black in water*. The result is a perfectly smooth, intensely black paint. Coat the plates thickly and lay them face downwards on clean paper to dry, which they will do in a couple of hours. (*Re* Winstanley on phosphorescence, it may be well to keep the writing paper in the dark when not in use.) On examining by the red window, the backing will now be found perfectly opaque, which is not the case if it be *thinly* brushed over the plates.

Plates thus backed at night may be left to dry until morning, with full confidence that the light from the window cannot get at them through the backing.

A PORTABLE CHANGING BAG.

By Edmund E. Fearn.

On starting for a photographic tour last year I was at a loss as to how I should change my plates, having only one double slide and no changing box, so I hit on the following plan:—

Taking a piece of black selisia, double thickness, I folded it in half, and stitched the two sides together so as to form a bag, three feet long by two feet wide, and along the open end I hemmed in a piece of tape, so as to enable it to be drawn together. On one side I cut out a piece about six inches square, and inserted one piece of canary medium and one piece of ruby fabric, the latter being fastened on one side only, to be used if necessary; the bag being now complete. To change the plates I put the bag over my head and draw it tight round my waist by the tape, which keeps out actinic light and also allows the plate box to rest at the bottom whilst changing.

By the above means, plates may be changed either in field, hotel, or railway carriage, without the trouble of blocking up windows or being a nuisance to anyone. The bag may also be used as focussing cloth, so as not to increase the outfit, and it may also be made of black velvet instead of selisia.

MY EXPERIENCES.

By A. E. Bannister.

Having dabbled in the Black Art for years, having waded through from glass positives up to the latest craze, and having constructed nearly everything except lenses, I ('Fools rush in,' &c.) possess sufficient self-conceit to think my experiences in apparati may be at least interesting, if not instructive, to some of my fellow shadow catchers.

The Camera.—Rising front, vertical only needed; double swing back, turns on end for vertical pictures (reversing back adds to size, weight, and thickness). Conical bellows. Baseboard with pencil marks for focus of usual lens (have secured sundry pictures with broken focus screen by this), and if possible an arrangement for sliding camera out to approximate

focus, before screw, rack, or other fine adjustment comes into play. Keyhole shaped slot in baseboard; for tripod top, bolt to enter and slide along so that when camera is fully extended tripod can be central and steady. Rising front to have plain flange for bayonet joint. String and bullet from top of side of swing back, thus dispensing with fragile levels. Camera not too light, to prevent unsteadiness. No loose screws. Slides, double metal ones; heavier than wood, but only half the width, and can be put down without fear of light getting in. Order all you want at one time, as they vary in size. Lenses all to fit front flange with bayonet joint. Wide-angle ones can have largest aperture made larger for interiors, &c., where light is bad. Use smaller stop, of course, in working. Take great care the lens mounts, interior of camera, &c., offer no reflective surfaces. Tripod, stout sliding one on Kennett's plan, top larger than is generally supplied. Bolt with thumbnut remains in tripod top, pushing into camera baseboard and screwing up. Three short pieces of rubber tube are useful for feet in working on shipboard. Focus screen of ordinary glass, matt varnished, answers well. Safety pins to focus cloth prevents bad language.

Nothing in all this that's new! Well, I guess not, but I fancy some of the above items are more honoured in the breach than in the observance; if not, pass on to the next.

PRINTERS AND PRINTING.

By J. Hubert.

Wanted, a Good Printer. Can't be had for love nor money. Why? Because the majority don't love printing. What is the reason?

Ah! *that* is a question of considerable importance, but not often inquired into, except by those who suffer. With these unfortunate people everything is constantly on the go. Printing frames go slowly—the silver bath goes quickly—the paper goes fast—and the printer at last. But the worst, a substitute must come and go, and in my case might have continued to come and go, had I not determined to train my apprentices after my own liking, being, moreover, convinced of the necessity that any photographic aspirant who wishes to become a good operator should be able to print, tone, and finish photographs in the most perfect manner. To appertain to this, a great part of an apprenticeship should be spent on these operations, otherwise the neglect of this important branch will hamper the improver in the most trying manner afterwards. To become a good manipulator in all photographic processes it is imperative that all effects should be understood by their causes, and to do this thoroughly at least an elementary knowledge of chemistry is needful.

To what can the boy aspire who mechanically changes his prints when they are just two or three degrees deeper than their final state, and who washes his prints just four times, and tones them to one uniform tint never to be changed, who fixes the prints for exactly ten, fifteen, or twenty minutes, in accordance with instructions of a sort, without knowing why he does all this? Who is to blame for thus substituting so many human machines for intelligent workers? It is but the consequence of the ignorance predominating amongst the majority of photo-

graphers of the earlier collodion era, of those men who, entering the ranks attracted by the hope of exceptional gain with a minimum of labour, could not teach their apprentices what they did not know themselves; and so it came to pass that the skilful printer is a rarity in these days of advanced science.

If an apprentice cannot succeed in making a stipulation in his indentures never to go near the printing room during his term, he will assuredly avoid it if possible. If he is a sharp lad, he will generally know all about printing in less than three days, whilst the slowest never takes more than a week to master it. However, after the lapse of a year or so a reaction sets in, and if he is candid will admit that he is just beginning to find out that first-class printing is not so easy as it looks, and if he has a good teacher, and is capable of reasoning, will then make up for lost time.

Of the various processes a finished photograph has been subjected to, printing is, next to operating, the most important; and if we consider that it is the print itself which, having undergone various delicate operations, passes directly into the hands of the customer, should we not then bestow the greatest care upon it? Is it not a deplorable fact that men who are content with earning their livelihood by working without thought, do predominate amongst our printers? Should we see such sickly colours and experience so much early fading if the bulk of printers understood the exact reason why such and such a proceeding brings about such and such a result?

If that is so, it is clearly our duty to raise our status by only admitting intelligent and industrious youths as apprentices; and if it is found that we ourselves are not efficient enough to teach them all they should know, let us not be ashamed of the good old proverb—'One is never too old to learn.' There are many clever men who would gladly have availed themselves of the chance of a scientific training if in the springtime of their lives it had occurred to them.

Let the present generation profit by the many opportunities around them, and not be like the inhabitants of the city of Bath, who leave the benefits derived from its waters solely to strangers. Then printers need never fear being in the position of the organ-blower whose claim to a share in the production of the *Messiah* was met with contempt, but they will be recognised as honest workers in the field of science, destined, perhaps, to bring about the perfection of photographic printing.

TRIMMING PRINTS.

By George Bankart.

It is not quite an easy thing to trim a print with edges perfectly parallel to the perpendicular lines of buildings without making a mistake, and so wasting an important slice or two off the print before it is cut correctly. The following assistant to such work has been in my own use for many years, and makes the process very easy and perfectly successful at the first operation. Get a sheet of clear *thick plate glass* (of any convenient size), have it cut *perfectly square*, and the edges made free from any slight roughnesses, or polished if preferred.

On *one* side only, now rule a series of fine lines across each other,

like the squares of a chessboard. If this is carefully done with a T square (applied to the edges of the glass plate) and a writing diamond, the lines will show very distinctly when looked at from the other side of the glass.

To use it, lay the print on a smooth board or table, face upwards; place the squared glass over it, with *marked side downwards*, and slide it about until one or more of the engraved vertical lines coincide with the perpendiculars of the buildings, bring the bottom edge of the print below the edge of the glass plate to the base line it is intended to cut it off to, and with the point of the knife or a needle make two stabs *through* the print at its outer corners, *close to the edge of the glass*. Now remove the print, place it *face downwards* on the glass plate, and taking the holes made as a guide, place a straightedge to these, and cut the paper edge clean off.

This edge forms a true base line at right angles to the perpendiculars of the print, and you have only to cut the other edges *by it* with a metal 'square' to secure a print trimmed with the buildings perfectly true and upright.

It is also a pleasant guide for studying the print, and deciding *how much to take off it*, so as to give the subject its best pictorial boundary of dimensions; a point of great importance, but very much neglected by many, who seem to think it advisable to mount as *much print* as possible from a negative, regardless of the shape best adapted to the subject. The print, as seen through the plate glass, is kept smooth and flat, and looks at its best for examination.

The smooth surface of the sheet of plate glass is an excellent one to cut paper prints upon; the knife makes a very clean edge to the paper and does not become dulled to any material extent.

I hope readers of the ALMANAC may find this simple contrivance a source of comfort and speed in getting through the mechanical operation of trimming their prints for mounting.

ALKALINE DEVELOPMENT.

By HERBERT S. STARNES.

A LETTER from a friend of mine has just suggested a subject for my contribution to the ALMANAC. I had sent him some plates of my own preparation, with a formula for development, and he replied that he had tried them with his standard developer and that they did not give very good results, and that he did not care about any plates that would not stand that.

I am afraid that there are many photographers like my friend, who condemn any plate which does not give perfect results with a certain developer or mode of development to which they are accustomed. That is the one standard by which everything must be judged in their eyes.

On the introduction of collodion and gelatine dry plates and alkaline development, the altered conditions in which the photographic image was formed seemed to have been entirely overlooked, and experimentalists went floundering about trying to explain away new facts which practice was daily bringing to light by the theories they had learnt from the old text-books.

If we carefully look into the conditions under which the photographic image is formed in a dry plate, we shall then be able to see more clearly the reasons for many of the pitfalls and failures we meet with in development, and if these conditions are once thoroughly understood one will be able to work with so much more confidence.

As most of your readers are, of course, aware, the dry film on the glass or paper consists of a vast number of minute particles of silver bromide embedded in a film of gelatine or collodion. But this is not all. The collodion or gelatine not only acts as a vehicle to hold these particles in suspension, but where the latter have not been acted upon by light these vehicles protect them from the developer and prevents it reducing them to a metallic state. Were it not so, photography with alkaline development would be an impossibility, because pyrogallic acid with an alkali reduces silver bromide whether it has been exposed to light or not.

This one fact swamps entirely the sub-bromide theory of light in its application to the latent image in a dry plate, because that theory is founded on the basis that the developer is unable to reduce the particles of silver haloid until there has been a change produced in those particles themselves by light.

The difference in the two cases is this: in the old acid development processes the light produces a change in the silver haloid particles themselves, but in the dry-plate processes the alkaline development depends upon the amount of the physical protecting power that the vehicle has in preventing the whole of the silver salts being reduced by the developer.

I will not refer to the question of the latent image further than to say that my own opinion is that the light causes a vibration of the particles of silver bromide, that this vibration bursts or destroys the protective power of the gelatine immediately surrounding them, which allows the developer to reduce them to a metallic state. Further, that as soon as the contractive power of the gelatine is destroyed the reduction to a sub-bromide then commences, which is what is produced in the case of thin, over-exposed plates.

I think the difference in the rapidity of gelatine and collodion dry plates is due to the difference in the physical power of the vehicle in controlling the vibration of the silver particles. In the case of gelatine, by prolonged emulsification there would be a decomposition or weakening of the contractive properties of that vehicle surrounding the silver particles, which would allow the latter to be set in vibration by a much weaker light. There is also, during prolonged emulsification, an aggregation of the primary particles into groups, which is also an important cause of increased rapidity, because the protective surface of the gelatine immediately surrounding the group is less than when each particle is bound up by itself.

I think I have said enough to show how it is that in practice we find such different results obtained from different samples of gelatine. Indeed, I feel convinced that that is the only practical difficulty we have to contend with in emulsion making to get certainty of results.

To pamper to the absurd rage for 'rapidity before everything,' the plate makers often advise the utmost amount of alkali possible in their standard developers, and when they test the plates the gelatine may have sufficient protecting power to stand it without fogging. But when these plates are sent into the market, subjected to great changes of temperature,

&c., can we wonder that when the deciding cause whether a plate turns out good or bad depends upon the physical condition of such an unstable substance as gelatine, that plates fog and are condemned when subjected to the same developer as was used in the testing room?

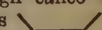
My own plan of working is to put one of a batch of plates in a dark slide, put it two feet from a candle, and pull the shutter out a quarter of an inch at each tick of a metronome (the tick of a clock will do as well). I leave about half an inch of the plate unexposed at the end.

I then develop with a two-grain solution of pyro, and add one minim of a saturated solution of carbonate of potash; at the end of five minutes I keep adding small quantities of potash and soda until the plate fogs. I then know the comparative speed of my plate, the amount of alkali it will stand, and its general characteristics as to density, &c., and I then make my developer up to a formula to suit the plates. I do not believe in having one standard developer until we can get a gelatine or other vehicle unvarying in its behaviour.

EVENING PORTRAITURE.

By Edgar Clifton.

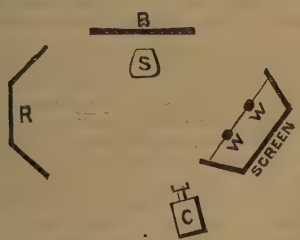
At the season when this Annual comes into the hands of most of its readers, there is little going on in the way of negative making, at least as far as the amateur contingent is concerned. Snow scenes after the first dozen or two become monotonous, even if the photographer is willing to risk rheumatism in his ardour for the picturesque. Outdoor portraiture is out of the question, for although the light may serve it is too much to expect a lightly clad sitter to look cheerful with the mercury anywhere near freezing point, while the light is rarely good enough in winter for 'drawing-room portraiture' in the daytime.

Christmas time, too, with its family gatherings affords so many opportunities for getting portraits of those who have not the time or, perhaps, the inclination to visit our professional brethren, that I put forward the following description of a somewhat primitive artificial light apparatus in the hope that it may afford some of our enthusiastic friends an occasional evening's pleasant occupation. It may be premised that all the articles necessary, with the exception of the illuminant itself (magnesium ribbon), are to be found in any ordinary house. The method of proceeding is as follows:—An ordinary four-fold screen is closely covered with a white sheet, preferably of paper, although calico will answer fairly well, and stood with the wings placed thus  as shown in the diagram at end. A light rod or lath is laid across the top of the screen about eight inches from the back; from this lath hang two stout wires, each about a foot long and eighteen inches apart, with the ends twisted into a clip to hold the ribbon, of which (with an ordinary full aperture portrait lens) about six inches will be required in each wire holder for an exposure. Now, magnesium ribbon has an unpleasant habit of melting during combustion and dropping in blazing masses to the ground, that is to say, if it is held vertically. This, though effective from a pyrotechnic point of view, is undesirable in the case of portraiture, so that we will fix our two lengths of ribbon in the holders horizontally and paral-

lel with the back of the screen, the two free ends pointing together. An old tray should be laid below to catch the hot ash, and a sheet or two of white paper placed across from the screen to the top lath to reflect as much light as possibly downwards, and the lighting arrangement is complete. Another screen or clothes-horse covered with a white sheet should be used as a reflector in the usual way. The posing chair and background we must leave to the operator's taste; a small graduated background such as Scholzig's will be found most pleasing in the majority of cases, care being taken to place the sitter at such a distance from it that his shadow may not appear too near to his head.

There is nothing very novel in this method of utilising the magnesium light, and those who have used a similar arrangement may think the foregoing description rather stale, still there are thousands in the new generation to whom the experiments of fifteen or twenty years ago are unknown, and whose experience of the magnesium light is confined to burning a strand or two without the very large diffusing power necessary, and they have been disappointed with the results. Let them look out the remainder of their ribbon, burn it in the simple apparatus I have described, and succeed. One point is important for the steadiness and success in burning the ribbon—it must be straight, horizontal, and clean, before it is ignited. No cap is needed for the lens, as the exposure only commences when you ignite the ribbon.

The annexed ground plan shows the whole thing.



B. Background. S. Sitter. C. Camera.
R. Reflector. W. W. Wires carrying magnesium.

THE CAMERA OF THE FUTURE.

By W. H. Harrison.

Three or four years ago a long series of articles from various experts appeared in The British Journal of Photography in relation to the tourists' camera of the future, and if any camera maker had gone carefully through those articles, writing down *every* suggestion made therein by experienced tourists, and afterwards considered to what extent their wants could be practically met, a greater advance than at present would have been made in the construction of such instruments. Slowly, indeed, some of the suggestions have been adopted, but much remains to be

achieved. Frequently in tourists' work in mountainous and other districts, where the catching of passing curious atmospheric and other phenomena is merely a question of the rapidity with which the apparatus can be erected, one lens changed for another, and the camera if necessary turned upon its side or the plate otherwise reversed in position, the camera is so made that it will not instantaneously fulfil the whole of these requirements, and a failure in the one point vitiates the value of the instrument.

Mr. Thornton has gone part of the way in meeting some of the requirements mentioned, by allowing the mounting of several lenses upon a revolving disc, so that if one does not answer for the purpose another can be instantly wheeled into its place; he has also, as suggested by Mr. Donkin, attached a short piece of hanging wire to one side of the camera to let the user see at once when the baseboard is truly horizontal—information often wanted when erecting a camera on steeply sloping land, with nothing but precipitous mountains, and no straight lines in the picture. Whether the plan Mr. Pringle found it necessary to adopt, of making a contrivance enabling one lens to be instantly 'sprung' into the place of another, is better than the revolving disc, experience alone can determine. Probably the camera of the future, which must have no loose parts, will be a cross between the best of existing cameras and what are called detective cameras. The latter require no erection of parts, nor should any good camera require them, but they have not usually a rising and falling front, nor have those motions when present usually a sufficient range; the detective cameras also in most cases have no swing backs.

Mr. Samuels has done something to simplify detective cameras and to avoid the weight of dark slides; cannot he store his battery of plates in one large dark back so as to allow a swing motion? All swing motions should have their axes in a line with the centres of the plates, or the user of the camera will be put to unnecessary waste of time and trouble.

One inventor, whose name I forget, has constructed a bayonet joint in place of the camera screw, which joint allows moderate shifting of the direction of the camera to the right or left; this seems one step in the direction of the advent of a camera which shall be ready for use the instant it is clapped upon the top of the stand. All plates used in small tourists' cameras should be of thin glass, like that obtainable of one firm in Birmingham and London, as discovered recently by Mr. J. Traill Taylor. In the case of the true tourist, who goes afoot for hundreds of miles over hill and dale with all his clothes and baggage on his back, and is independent of railways, porters, and conveyances, nothing much larger than a quarter-plate camera can be carried, and it is necessary that without sacrificing rigidity, every fraction of an ounce of unnecessary weight in any portion of the camera shall be saved; in such cases the weight of brasswork in lenses needs special attention. The camera of the future will perhaps bear distinct relation to the box camera of the past, and to the detective camera of the present, in which case the box itself might be made lighter than if built up entirely of solid wood; perhaps a split bamboo framework covered in with pasteboard, covered again with American cloth or other waterproof material, might be a step in the right direction. In such case, of course, the moving parts of the camera would be supported by the rigid wooden framework only. There

is still an opening for a maker who will turn out a camera to meet *all* the requirements of the tourist instead of but two or three of them.

The objection may be raised that rising and falling fronts, and other adjuncts herein suggested, are unnecessary in cameras of such small sizes; but such objection is liable to come only from average practical photographers, who judge the wants of real tourists only by their own experience over excursions of a single day's duration in England. When a negative has been taken in a detective camera it can usually be recognised as having been obtained in that way, except in the case of specially selected pictures. The tourist, however, when near, say, the summit of the Matterhorn, cannot afford to take an imperfect picture, and would rather give a long exposure upon a slow plate, with a smallish stop, to get the most perfect negative possible; he may not, unlike the Hampstead Heath excursionist, ever be able to visit the scene again. He does not object to use a stand, but wants a negative perfect and full of detail for enlarging. When in remote regions, full of scenes of interest, and carrying his own baggage, he cannot afford to waste a single plate, however small it may be. Most enlargements can be recognised as such, but with exceptionally good work even experts have been deceived in this matter. It will, therefore, be the business of the tourist photographer of the future to overcome the difficulties in the way of making good enlargements; he will have plenty of time for this work at home. Probably the time is not far off when no lens will give satisfaction which has not an iris diaphragm. I do not care to purchase any camera from lantern size to half-plate unless it will extend at least twelve inches, and for half-plate prefer it to extend eighteen inches when desired; nor would I buy one which, when the rising front is fully elevated, will not permit either the lens of longest or shortest focus to be used, without the bellows cutting off some part of the image on the plate. In these points all cameras should be tested before purchase.

ON SOLIDITY OF CAMERA SUPPORTS.

By Edwin Cocking.

At one of the recent technical meetings of the Parent Society I asked a question respecting a matter which had arisen in my own experience. It was that on some occasions during the very hot summer we have just experienced the negatives I had taken were not quite sharp, although the focussing was most carefully attended to, and the question I put was, could this be owing to the heated atmosphere putting the rays from the object in motion? One reply then given amongst others suggested that the human eye, under extreme atmospheric conditions, was liable to certain errors; but that could hardly explain the case, because the same vision was used to gauge the result in both cases, and, therefore, probably when the focussing was seen to be sharp and it really was not so, why did the same eye see the negative not sharp when according to this explanation it was so? It follows then that the cause must be looked for elsewhere. Upon thinking over the circumstances, I recalled some facts which had hitherto not been taken notice of. The negatives alluded to were taken out of doors, a heavy, square 12 × 10 camera being used, with the usual sized triangle for such

a camera on the top of the stand, and it was just in this direction that we think the difficulty occurred, because there must have been some special reason for any disturbance to have arisen, and that was neither in the heat nor yet in our eyesight, but in the camera, arising from some vibratory movement communicated to the same, and this was intensified or multiplied by its working upon a small base, which, being triangular, permitted three sides over which the camera could be inclined, and, if that was not enough, there was the large focussing cloth, which aided and abetted any tendency of the camera to wander from the right path. Well, here, then, was a large superstructure, with some drapery added, upon too small a foundation, and thus a trifling amount of wind, so slight as hardly to be noticed, would give a bias to this top-heavy combination, and so the difficulty complained of must naturally be a consequence.

Well, the first thought is, Why persist in using a triangular support for a square body? The reply must be, Because this is always put before the photographic world, and in the modern craze for putting everything almost into a nutshell, any proposed additional appendage is discarded, and we are becoming slaves to ourselves in the avoidance of too much toil in locomotion and muscular exertion.

Well, the outcome of these remarks resolves itself simply into the recommendation of a *square*-cornered baseboard being used, where four legs can be attached to the front and the two back corners; thus a double good is gained, by the legs at the top being farther apart and by the camera always resting upon something and never overlapping, consequently it must stand so steady that a moderate wind will not affect it in any way.

This no doubt has been made and used before and is nothing new, and it is only alluded to at this time just to emphasise the attention being given less to the modern tendency to fragility and more to absolute solidity.

A FEW HINTS ABOUT COLLODION EMULSION.

By Alexander Mackie.

It has been demonstrated during the year that, by a simple additiona process, collodion emulsion plates may be rendered almost as sensitive as gelatine, and, at the same time, isochromatic. It is therefore probable that many purposes will be found for which such plates would be particularly suitable.

For cloud negatives it has been generally recognised that collodion is superior to gelatine, and, for this purpose, collodion plates rendering blue and yellow rays in their correct relation and not requiring an excessive exposure, will, no doubt, be extremely valuable. A desirable quality in a cloud negative is that it should be possible to print from it from either side, and for this reason a film negative is preferable to one on glass. By an easy adaptation of the method employed by the Eastman Company for stripping their 'stripping films' from glass plates, film negatives may be made from collodion emulsion plates. For this end the glass plate should be prepared before coating with emulsion by giving it a substratum of wax in ether or French chalk, with an edging

of indiarubber. After development the treatment is substantially that employed for the stripping films, that is, the plate is placed on a perfectly level surface and sufficient gelatine solution poured on and allowed to dry. The stripping skins may be used, but the collodion film being very tender indeed the risk of injuring it is great, and in employing them it is advisable to treat the plate with a weak solution of gelatine to secure adhesion, as the same pressure cannot be applied as in the case of the films for which they are intended.

For lantern transparencies collodion emulsion holds its own in spite of the many brands of gelatine plates now in the market prepared especially for this work. The process of making washed emulsion has been reduced to such simplicity that no one with the exercise of ordinary care need despair of success. For transparency work there is not the slightest occasion to aim at rapidity, therefore the elaborate precautions and complicated formulæ of the olden time are quite unnecessary. The secret of success appears to be in using a suitable pyroxyline. With some samples no amount of care seems to ensure success, while with others failure is almost impossible. It is therefore well when the right kind is met with to lay in a sufficient stock to last for some time. The home manufacture is not to be recommended, as the process, besides being an unpleasant and dangerous one, is very uncertain even in the hands of experts. Should it, however, be impossible to obtain it, I would recommend that instead of the ordinary pyroxyline, papyroxyline be employed. In mixing the emulsion a considerable excess of the bromide salt is permissible, and the amount of water used to dissolve it, and also the silver may be more than that usually given without harm resulting.

The easiest and in every way most satisfactory method of preparing the glass, is to immerse the thoroughly clean plates in a weak and very hot solution of gelatine about twenty to thirty grains to the pint, and then to dry them while hot with a clean cloth.

The development is preferably by alkaline pyro, and either liquid ammonia, or the carbonate of ammonia, potash, or soda, may be employed, the proportion being suitably adjusted. Any of the following formulæ will be found to work well:—

	Liquid ammonia	2 minims	With 8 grains of pyro and 4 grains bromide of ammonium to each ounce of developer.
or,			
	Carbonate of ammonia ...	15 grains	
or,			
	Carbonate of potash	24 ,,	
or,			
	Carbonate of soda	40 ,,	

Sulphite of soda may be used and the proportion may be larger than usual, as, unlike its action with gelatine plates, in which it causes the image to be black and cold, with collodion it tends like many other of the neutral salts to give a warm and pleasant coloured image. The alkali employed also, to some extent, affects the tone; with carbonate of ammonia the image inclining to pink, and with the carbonate of soda to green, but the greatest factor in determining the warmth or coldness of the image is the exposure the plate has received. A short exposure and forced development invariably giving a cold result, while a full exposure is required to produce warm coloured tints. For development a dish

may be used, or the plate may be held in the hand and the developer flowed on as was the practice with wet plates.

A properly prepared emulsion should give absolutely clear glass in the lights of the picture; with some samples of pyroxyline, however, a slight milky or opalescent deposit will be found which degrades the image. This disappears on varnishing, but except in such cases it is better not to varnish, as it is almost impossible to avoid some specks of dust which do not add to the beauty of the picture when they appear highly magnified upon the screen.

THE META-BISULPHITE DEVELOPER.

By J. A. D. Lloyd, Assoc. M. Inst. C.E.

A few notes on the working of the above developer may not be without interest to tourists, explorers, and others, who have the troubles of a hot climate to contend with, and to whom it is no small advantage to be able to carry about chemicals in a dry state. My attention was first drawn to it through Mr. W. Brooks's contribution to your last year's edition (page 139), and I at once remitted to Messrs. Mawson & Swan four shillings, and received from them by Indian parcel post, prepaid, three-quarters of a pound of meta-bisulphite of potash, and also one of their very useful little Pocket Diaries.

My experiments on the preserving properties which this salt has, both on pyro in solution and also on the mixed developer, give the following formula as best suited for outdoor work:—

A.

Pyro	1 part.
Meta-bisulphite of potash	¼ ,,
Water	10 parts.

B.

Carbonate of potash	1 part.
Meta-bisulphite of potash	¼ ,,
Water	10 parts.

No bromide is required.

Each ounce of developer to contain (more or less, as recommended by the maker of the plate), say, 2 grains (20 minims) pyro, and from 2 to 4 grains (20 to 40 minims) potash. No acid is required to preserve the pyro, and no restrainer. Too sudden appearance of the high lights is at once checked by the addition of a little water, after which the development will proceed satisfactorily until the end. This developer gives beautifully clear shadows, and *any amount* of detail. No clearing solution is required. The negative can be 'alumed' either before or after fixing. If after, the hypo can be used until exhausted, even after it has become quite brown. I have used this developer in various temperatures, and like it better than any formula I have yet tried; for simplicity and permanent nature of the chemicals it is unequalled. In cold weather I have used as much as four grains, and in hot weather as little as one grain, of potash to each grain of pyro.

One half extra exposure will give a delicate negative, brimful of detail, with fine clear shadows, just what is wanted for contact printing with

Eastman's gelatino-bromide paper, whilst reintensifying to any extent can easily be brought up with the usual mercury and sulphite of soda treatment.

LITTLE TRIVIALITIES.

By J. W. Lapham.

A good deal has been written lately about the prevention of halation in negatives, but, so far as I have seen, very little concerning any remedy for it when it has made its appearance, I suppose on the principle that 'Prevention is better than cure.'

The remedy I find most useful is to rub the portion of the negative affected by the halation with a piece of chamois leather wetted with methylated spirit. The best way is to cover the top of one finger with the chamois, and rub the negative with a circular motion, changing the part of the chamois as it becomes black, and taking care to keep it well wet with the spirit. When portions of a negative are found to be over intense they can be reduced by the above method.

As a medium for covering the windows of temporary dark rooms, I am surprised that common orange tissue paper is not more used, as it gives a very safe light, and pleasant to work by. Having been away from home for a considerable time during the past summer, I fitted up a dark room by covering the window of an ordinary room with brown paper, leaving a space of about eighteen inches by twelve, which I covered with six-thicknesses of orange tissue paper, together with two of a bright, rich yellow, and the light was quite safe, even with very rapid plates, and the sun shining directly on the window. Of course, I took the precaution of not bringing the plates too near the window till development was well advanced, and not exposing them to the light more than was necessary. I developed a large number of negatives, and not one of them showed the slightest trace of fog. *Apropos* of fog, a frequent source of this trouble arises from the blacking being worn off the inside of parts of the camera and lens tube. An excellent dead-black for coating the inside of cameras and lens mounts can be made by dissolving shellac in methylated spirit and adding dry lampblack till the mixture is of the consistency of thin cream. This should be laid on with a soft brush, and it dries very rapidly, but if too much shellac is used the black will dry glossy. With a larger proportion of shellac and less lampblack, this makes a splendid black polish; but in this case it must be applied with a linen pad in the same manner as French polish.

CZAR BITS.

By Lewis Medland.

In August last, after a calm and fog-horny voyage, Copenhagen was reached, where I commenced operations with my camera. Having taken most of the 'lions,' and a few 'lionesses,' I finished up with the Czar's yacht with the unreadable name, and which defied all the efforts of the passengers to decipher. We were told it was the *Derjava*; if so, the man who gilded it was either somewhat intoxicated or stood on his head, for most

of the letters are upside down. A few days more of quiet steaming in the almost fresh waters of the Baltic, and the steam yacht *Ceylon* anchored off Cronstadt. Soon the deck was bristling with Custom House officers and their attendants, which latter I fear have never seen any of those (to us) familiar soap advertisements. It is said, 'While there's life there's soap,' but with them it is not so. Picking out the least encrusted one, I asked him if I might take my camera ashore; he replied in two or three languages, 'Yes, if you bring it back.' This somewhat took me aback, as all along I had fancied they would confiscate it. St. Petersburg, seventeen miles off, was reached in due course by river steamer. By omnibus to a hotel, where we soon found out the value of roubles and kopecks, as four of us had to pay about 9*s.* 7*d.* for doing that which seems not to be the custom of the country, viz., washing our hands. Off to Moscow that night by that straightest and most uninteresting of railways, a distance of about 400 miles of trees, flats, huts, haystacks, and cabbage gardens. An evil-eyed Russian official haunted me all night, sitting as he did close behind me; no matter when I turned round one optic was on me, and the other on my camera bag and tripod. Reaching Holy Moscow next morning, we were soon at the Hotel Berlin. A wardrobe had to be utilised as a dark room; so having a five minute match, safety-pin, and five kopeck piece surrounded by orange paper, I retired within, a friend locking me in so that the door should not open in the middle of changing plates. Soon it became warm, then hot; in the meantime I had kicked, shrieked, and otherwise attempted to make my absent friend hear me, the light went out, and I had to breathe as I could at the bottom of the door. At last I was released just in time; the fact was my friend had forgotten all about me. After this I got the hotel proprietor (a German) to tell a droschkie driver a round which comprised all the chief objects of interest.

My first exposure was on the Cathedral of St. Basil, the architecture of which is unique, and so probably thought the architect soon after he had replied in the affirmative to the then reigning Czar, on being asked if he could build another like it. It is recorded by the order of that Czar his eyes were put out there and then. A policeman here came up, and showing him a piece of paper whereon were certain Russian translations, while he was thus occupied I focussed the Bazaar Square, a spot where Ivan the Terrible massacred so many. By showing him how the shutter worked, the exposure was made. Through the Spaski Gateway the Kremlin was reached. Here the Great Bell is situated. Taking time to get a full half-plate of the 'Monarch,' the shutter set and slide drawn, when looming in the distance I saw an imposing uniform. I was about to wave my hand in order to prevent his coming to the front, when I tumbled to the situation and pinched the pneumatic ball and awaited results. Mr. Warnerke's translations again came handy; while the 'uniform' was spelling it out I was transferring the 'Bell' to the bottom of my bag. After many 'koffs,' 'whiskies,' and sore-throat-like sentences, I began to see I was 'wanted.' On strode the uniform, behind him followed your humble self until we reached the gloomy portals of the Kremlin police station. Here a much be-medalled official questioned me in various languages, but what he said I know not—I daresay he was perfectly correct all the same. Into his office I was ushered, and here by dint of great perseverance, a few words of French, still less of German,

a pile of English, and heaps of signs, I made this official write his requirements down so that I could get it translated at the hotel. This done, a final verbal effort was made on both sides, ending in an utter failure, and both of us bursting out laughing. Getting back to the hotel by accident, for I could not drum it into the droschkie driver I wished to return; probably I had omitted a 'koff' somewhere and was not aware of it. The note said I must go before the city police. A guide luckily being at hand we went, and after going through six or seven departments we were sent to that presided over by the chief of the police, Prince Dolgorouki. Here I was informed I ought first to have written for a permit, then after full inquiries had been made as to who I was, my political views ascertained, and I had been literally turned inside out, then in about three months time a decision one way or other would be arrived at. I left Moscow that night after taking some views from the hotel balcony and from the Sparrow Hills, where, wonderful to relate, no emissary of Alexandrovitch was present. Something wrong here, Alex. No. III. Again on the Czar's birthday at St. Petersburg I took several views of the grand procession in the Nevsky Prospekt, and other points of interest from the hotel windows. I did not ask General Gresser's permission for fear he would not grant it, so took French leave. Cronstadt's forts, harbour, &c., fell to the camera from my porthole, also after leaving our anchorage. In all I managed to expose between thirty and forty plates in the Czar's dominions.

Another quiet journey to Stockholm, that Northern Venice, where many scenes were secured. Christiania followed with a like number. This being our last port, we reached home towards the end of September, after a most enjoyable trip with my camera.

N.B.—I fear, Mr. Editor, if this ALMANAC reaches Russia, the recipient will have the principal parts of my sketch obliterated by that kind and considerate party of Censors, so to save them trouble had you not better advise them beforehand, in order that they can get the right sized block made ready?

ON THE AMATEUR QUESTION.

By C. C. VEVERS.

ONCE more, in this and other photographic journals, the old 'Amateur Question' has been revived. To look at the matter from a neutral point of view one is inclined to ask, 'Has not the amateur as perfect a right to the benefits of photography as the professional?' In a sense he undoubtedly has; yet he is injuring a beautiful art, turning a science into a plaything, and damaging, if not ruining, many a professional's business. The amateur disquisition is one which requires careful and systematic examination and deliberate study, before any satisfactory result can be obtained, and a few short and scattered letters to the journals will not conduce to bringing such result about. In the first place, the writers of these letters seem divided as to whether the amateur does or does not injure the professional's business.

But before answering this question we must first decide *what is an amateur*. Nuttall's definition on this point is rather vague and unsatisfying—'Amateur: one versed in any particular art, but not a professor

The genuine amateur photographer, I may safely say, is a person who practises photography for the pure love of the art, as a scientific pursuit, and as an aid to procuring lasting mementoes of excursions, pictures of favourite places, friends, or animals, for his *personal pleasure* only. By this the amateur will appear to be a very selfish person, but I have endeavoured to show him as one who uses photography as a pleasure, and not as a means of obtaining money for his work, whether it result in profit or loss. This gentleman certainly does *not* injure the profession, but rather advances it, as he educates the public to have a love and respect for the art, and, moreover, shows them that photography is not such a simple and inexpensive science as many of them are inclined to think.

We next come to the 'amateur' who is willing to sell his products for 'just what they cost.' Now this person certainly does harm. His friends receive half-a-dozen *carte-de-visite* photographs for, say, 1*s.*; then when a professional informs them that *his* price for the same number is just four times this sum, they stand astounded, wonder at the impudence of such a man, and marvel at the enormous profits to be made by the practice of photography professionally. Naturally they do not take into consideration the fact that the photographer has a studio to maintain, a staff of assistants to keep, rent, rates and taxes to pay, a variety of apparatus, accessories, and materials to purchase and frequently renew, and—but enough; no one knows better than my readers the expenses of 'running a gallery,' as the Yankees say, successfully and turning out good work. But this person does not do the profession a very great deal of damage, because he is disinclined to work much at 'actual cost;' but eventually he emerges from the chrysalis state and bursts forth a hardy semi-professional moth.

This is the man who is ruining the trade. *He* is not dependent upon photography for his bread—he is occupied in some other business, which, mayhap, does not require all his attention. He purchases a second-hand background (it matters not if it be interior, exterior, or a mixture of both) and a rickety head-rest; he hangs the former against the wall at the back of the house and erects the latter before it, with a bedroom chair in front of that, and, possibly, if his sitter be an important personage, a small table at its side. His studio and accessories are now in working order. His sitter arrives; he brings forth his landscape camera, single meniscus lens, and tripod stand; he wedges his client's head into the fork of the rest, gives him a book to hold in his right hand and the table in the other, obligingly moves the whole paraphernalia four inches to the left, as the drip from a defective spout above was falling down the sitter's neck and might possibly cause him to move at the critical moment, focusses, inserts a slide, says, 'Look in at this hole' (the lens), exposes, remarks, 'That'll do now; come across for 'em in a day or two,' and disappears into the bathroom or cellar to develop. He is a true artist—he does not believe in retouching; it is inartistic to retouch, he says, and he finds it saves him a lot of time and trouble, without counting spoilt negatives. He prints 'plain out;' vignetting and masking he is unacquainted with; in toning he is careful not to use too much gold: people prefer a brownish-yellow tone, he thinks. Twenty minutes' washing suffices. 'What if they *do* fade,' he will remark, 'they'll come to sit again all the sooner.' He pastes them on '5*s.* a-thousand' mounts; the glaze caused by burnishing

is untasteful to his artistic mind, so he does not burnish. He wraps the prints in a bit of newspaper, and when his patron calls for them he hands them over, saying, 'Finished? yes, sir; here you are, sir. Splendid likeness! Twelve *cartes-de-visite*, 3*s.*; same as —— charges 10*s.* for. Thanks.' Then, when the victim has examined them: 'Oh, it's a mere nothing! won't show outside. You see the spot on the cheek is caused by the defractive refulgency of the light so prevalent at this time of the year; be the same everywhere, sir. Oh, the feet! Well, you see, I thought I'd better leave them out, as they didn't look well—rather large, you see.' Artful(1) man, he couldn't get his camera far enough back to include a full length; but his customer goes away—satisfied? We-e-ll, eh—perhaps.

This is the amateur who does the harm, this is the person who should be stopped. He lowers the standard of the art and the professionals' prices at the same time. How is it to be done? That is the knotty point. He injures most directly the third-rate professional but the first-class establishments must sooner or later follow suit, bring down their prices and, consequently, the quality of the work.

Certainly, as Mr. Paviour says, it is the introduction of dry plates and the simplicity of the accompanying process that is the chief cause of this amateurish competition. As compared with the days of wet collodion every operation is ridiculously easy, and any one with a spare pound or two can procure an outfit superior to those costing ten times the amount fifteen or twenty years since, and including every requisite for 'setting up in business' with as a semi-professional. What a pity we can't revert to 'the good old times!' but it can't be managed.

Many others propose doing as some of the American photographers have done, that is, *boycotting* the dealers if they persist in supplying amateurs on the same terms as the profession. Yet many dealers' best trade is done with amateurs; and even if they *were* compelled to make a special discount to the profession, they would quickly find opposition houses for amateurs' goods only at the old prices. The amateur is certainly no enemy of the dealer: he is always taking up new fads, and purchasing new apparatus and materials; and were there no amateur photographers, the photo-stock houses would be reduced to less than one-half the present number. Suppose, however, for the sake of argument, that both manufacturers and dealers were inveighed into the one not supplying the middleman for amateurs' use, and the middleman declining to sell his goods to the amateur, what would be the result? Simply this: One or more of the influential amateur Societies—the Camera Club, for instance—would engage efficient workmen, rent suitable buildings, and manufacture and supply their brother amateurs as of old, or, perhaps, *worse still*, at less prices than the professional is obliged to pay.

The most reasonable idea, in my opinion, is the taxation of the amateur. Yet such a course would be beset with many difficulties and much opposition. Perhaps the principal line of defence against such a tax would be that the amateur is neither a public danger nor a public nuisance (although there are many who would affirm, with emphasis, *he is*), as are the gun and the dog. Still, call the camera a luxury, like tea and tobacco, then why should not the amateur be taken advantage of to swell the revenue? A 10*s.* tax on every amateur photographer would

form a pleasing item for the exchequer. But a great difficulty would be met with in proving who *were* the amateurs and who were the professionals. I am afraid the professional ranks would rapidly increase as soon as such a tax came into force.

Now what would be more effectual, and what is, I think, quite within the limits of practicability, is a tax on every photographer, amateur or professional. The result of this would be to thin the photographic world of the 'mongrel' amateur, just as the dog tax cleared off the stray mongrels of the canine tribe. We should then find the tenth-rate professional, the semi-professional (as previously described), and the amateur who takes up photography because he 'wants something to play with,' quickly disappear, and with them low prices and wretched work. It would stop but few, if any, of the straightforward members of the amateur brotherhood, who use photography as it deserves to be used, and leave the money-making portion of it to the professional. It would hardly affect the dealers in the slightest, for those who gave up the art, or those who did not commence, on account of the impost laid upon the photographer, are just those persons who spend very little on apparatus, invest in second-hand goods, and are neither a credit to the art or its followers. A tax of 10*s*., 1*l*., or even more would not be felt by the respectable professional, but he would immediately observe its effects in the diminished number of his 'cheap-work' competitors, the increase of his own business, and the general advancement of the art.

Of course there are many minor difficulties to be overcome, but I think if such a proposition were carefully considered by abler minds than mine some good would result, and a profession once honourable and profitable would be restored to its former eminence as a science and art.

A RELIABLE RECEIPT FOR SILVERING PHOTOGRAPHIC MIRRORS AND SPECULA BY THE BRASHEAR PROCESS.

By G. W. Valentine.

I venture to forward for our forthcoming and interesting Annual an exceedingly good and reliable formula for silvering specula, giving (when not having ammonia in excess) hard, brilliant films, far exceeding those by any other process. A thoroughly good process for silvering specula should be one that will give hard, dense films; one that, if held up to the sun, no light whatever will penetrate, and also will stand polishing well. All of these can be claimed for the Brashear process.

The Reducing Solution,

Which should have been made some time (say, months) previous to using. The older the solution the better it is.

Loaf sugar	840 grains.
Distilled water	300 ,,
Nitric acid	39 ,,
Alcohol	25 drachms.

Put the whole into a Winchester quart bottle stoppered, and add enough water to make twenty-six ounces total. The mirror to be cleaned nicely with a strong solution of nitric acid, after which to be thoroughly well

washed and immersed in a dish of clean water (face downwards) until we are ready for silvering. The back of the mirror having a round block of wood, with a stout screw cemented with pitch in the centre of back of mirror for to suspend from ceiling.

SILVERING SOLUTION.

Silver nitrate dissolved in 2 ounces distilled water	50 grains.
Potassa, *pure by alcohol*, dissolved in 2 ounces distilled water	50 ,,

Pour one-tenth of silver solution into another vessel to hold as a reserve. Next drop liquid ammonia into the silver solution until the light brown precipitate is entirely cleared up. Now pour in the potassa solution, when it will become of a dark brown colour. Clear up by adding, drop by drop, liquid ammonia, *and leave no precipitate.* Now is the time to drop in the reserve silver solution, carefully drop by drop, until we have a nice yellow-brown liquid. If you do not get this colour, make up a little more silver solution and drop it in carefully; and *never undertake to silver unless you do get it.* Now put in enough distilled water to make up the amount you need to come up, say, a quarter of an inch over the edge of the mirror. Stir well and add four drachms of reducing solution, and stir again thoroughly. Lift up the mirror and wipe the edge dry. Pour out the water in the dish or tray, and pour in your silvering solutions. Immerse the mirror diagonally into the solution to prevent bubbles, and if all be well—which it is sure to be if these directions are followed—the silvering will be completed in from ten to thirty minutes, according to the temperature of the room. As soon as the liquid is seen to become clear at the top of the solution, take out the mirror and well wash and dry it, by setting the mirror upright on edge with a piece of blotting paper underneath so as to absorb all moisture, and when thoroughly dry polish in the usual way. From 60° to 70° of heat is about that most recommended for the temperature of the room. All silvering solutions and utensils, including mirrors or specula, should be kept in the room it is intended to silver them in at least twenty-four hours previous to commencing, for this is one of the great secrets of success.

The above amount of silvering solution is sufficient to silver a six-inch speculum; rather more than double this quantity I should recommend for a fourteen-inch specula. Have rather too much silver than too little, and remember when clearing up the solution of silver and potassa not to add too much ammonia, as it is one of the chief *causes of thin, powdery films that will not bear polishing.*

RETOUCHING.

By REDMOND BARRETT.

A CAREFUL reader of THE BRITISH JOURNAL OF PHOTOGRAPHY, during the past year, cannot help being struck by the many and very uncomplimentary remarks hurled at this despised member of the photographic family. Yes; one may be fairly astounded at the number of slights and insults heaped alike upon retouchers and retouching. It seems a wonder

that this 'good for nothing' member of so illustrious a family (as some profess to think) has not long ago been turned out to starve and die and never more be heard of. But no! there he is, despised no doubt, but constantly made use of. I fear the first retoucher must have committed some horrible crime the punishment for which has fallen on his followers.

I scarcely think, with all the failings of the retoucher, that he receives justice or fair treatment generally. Besides, I do not approve of the *spirit* of the many remarks made about this important branch of photography. In my humble opinion I think the question really ought to be, '*Is* or *is not* retouching *a necessity* to modern photographic portraiture?' I will not presume to answer this, but simply say, that every photographer I know avails himself of its benefits and would not for a moment think of sending out his photographs in their *natural* state. The point, therefore, should not be to contemptuously decry the quality, or throw doubt upon the usefulness of retouching, but rather to devise a means for bettering its condition and eliminating from it those faulty points which seem so often to be the cause of so much vexation. May I ask the question, 'Do those who are loudest in their denunciations *ever* do this?' I think I may truthfully answer, '*Rarely*.'

Again, 'Is the work that is so often and severely run down, done by a really *first-rate* retoucher?' one receiving fair pay for good work. Or is it the work of a man employed by a photographer who considers his work '*good enough*' *because it is cheap?* It is not fair to expect a man of real ability to work for next to nothing. The matter rests altogether with the photographer, and he is the one solely responsible for the lowering of the standard of excellence of retouching. The malady which has attacked and ruined the health of good retouching is 'price!' and as long as that remains the first consideration, so long will inferior work abound. I would like to have one or two addresses of photographers who would give 4*l.* or 5*l.* a-week, as they did years ago, to *a really good man*, rather than 2*l.* or 2*l.* 10*s.* to a '*good enough*' man. Believe me, the fault lies at the photographers' own doors, and is the evil result of the universal desire to obtain an impossibility, viz., *first-rate work at a starving price.*

Sometimes, when I have more work than I can do myself, I get help and pay the *best price* for it. I find in the long run it pays me best, for I never get into trouble, and I have no anxiety that the work may not be all right. I well understand that the supply of so-called retouchers is far in excess of the demand, and competition should naturally reduce the price from what it was years ago, but certainly not to the low figure at which it is daily quoted. I am a firm non-believer in the real existence of the 'first-class operator and retoucher, good colourist, and worker in monochrome, 35*s*. a-week.' I look upon him as a 'delusion and a snare.' He will cause the photographer more loss in a year than would make up the difference to pay a good man a respectable salary.

I would be glad to see a movement started to better this condition of things, and worked on the basis of *mutual* benefit, a fair price arranged and only good work accepted. I would be happy to lend my poor services in any way that would be deemed likely to yield a satisfactory result. This never will arrive, however, as long as the photographer contents himself by simply using a selection of bad language at the way in which his negatives get spoiled, and stops at that. No; he must join

his brothers in an honest effort to insist upon a certain standard of excellence, and be content to pay a fair price for it. I feel sure a movement like this once started, there would be a serious weeding out in the ranks of the self-styled *retouchers*, and a more than perceptible advance in the quality of retouching generally, and this I feel sure is the object we have all at heart, although we do not bestir ourselves sufficiently to obtain it.

A HINT FOR RETOUCHERS.

By W. M. Ashman.

It is in no arrogant spirit that I have ventured to string together a few sentences under the above title. The deductions made are the outcome of observation, assisted by published researches which are available to anyone. I hope my retoucher friends will accept this statement in good faith, and consider that the object of this contribution is to assist them out of an oft-recurring difficulty.

Who among the devotees to the graphite point has not occasionally been sorely vexed by the sudden disappearance of a portion, if not the whole, of the intensity value of the work they have so diligently put upon a negative when the process of varnishing has taken place? To dwell upon this theme, however, merely serves to recall many unpleasant experiences, the like of which we hope to avoid in the future, and the following is an outline of the way proposed to effect it.

It is scarcely necessary to explain to the practised retoucher (and these remarks do not concern anyone else) that the troubles alluded to are due to the employment of an unsuitable medium, or, in other words, one that is readily soluble in ordinary samples of spirit varnish. But as there are to be found exceptions to every rule, so also it has been noticed upon some occasions that no loss is suffered with given samples of medium and varnish, which at other times bring about the mischief. With no apparent difference in the agents, this change is difficult of explanation. A slight alteration of the conditions evidently brings it about, as, for instance, a negative being made rather hot before varnishing, thereby modifying the character of the resin. A medium that has become thickened by evaporation may be insufficiently tough to resist the solvent action of a thin spirit varnish when heat is applied. Either of these causes suggested indicates the remedy.

Oil varnishes applied cold do not present the uncertainty above referred to, and their general adoption would be a boon to retouchers; but as spirit varnishes continue to be used, means for working them successfully have to be provided. Experience indicates that a greater degree of toughness is the property desired, therefore this special characteristic should be conferred upon the medium chosen in order to remove chances of failure. Of suitable toughening agents there are several from which to make a selection, among them, camphor, castor oil, Venice turpentine, and oil of lavender. The first object in compounding a medium is to provide for a surface which when dry shall respond to the lightest touches of the pencil point, whatever may be the degree of hardness selected. This can readily be obtained by dissolving a resin in a solvent such as turpentine (itself a very dilute solution of resin, which only needs evaporation

to yield a solid residue of resin). Turpentine of commerce not being sufficiently rich in resin for our purpose, we find it necessary to add a soluble resin thereto, and dammar is probably one of the best which can be chosen, but a plain solution of dammar in turpentine is not tough enough to be proof against the combined forces of heat and the application of a spirit varnish. This property, however, may be acquired by the addition of camphor, the proportion requisite being ten per cent. of the resin employed. Canada balsam in conjunction with dammar is equally efficient, so also is oil of lavender, and a combination of these ingredients may be regarded as being absolutely reliable. The points to be attended to are as follows: That varnish should not be applied to a medium until it has become dry, neither should it be varnished while the negative is hotter than can comfortably be borne when placed on the back of the hand. When the medium becomes thick by reason of evaporation, or is prepared with too much resin, it requires to be diluted with turpentine, and under any circumstances the addition of a volatile or second resin of a toughening character should not be neglected.

PRACTICAL ARTOTYPE OR COLLOTYPE.

By The Editor.

It was some time since my good fortune to witness, from beginning to end, the production of mechanical prints, which for uniform excellence I have never yet seen surpassed and very seldom equalled. The following was the process employed.

The printing plate consists of flat and moderately thick plate glass, which when cleaned is coated with a substratum of bichromatised albumen, prepared and applied in the following manner:—

White of egg, 150 grammes. Beat to froth with a few drops of ammonia. When liquefied add to it bichromate of potash, 3 grammes, dissolved in the smallest possible quantity of water in a beaker over a spirit lamp, the object being to have as little water as possible in the albumen. When dissolved, and still held over the flame, add a little ammonia until the deep orange colour assumes a tolerable light yellow colour. Now cool the solution and pour into the albumen, which is now ready for use. It remains good for a considerable time.

To apply to the plate, dip into it a flat camel-hair brush and draw it slantingly across the surface. Then apply the brush in sweeps across those made, and, lastly, from end to end. This is found to be the only way by which a perfectly even coating can be given.

It is now placed on the flat bed of a drying box or oven, heated to about 110° Fahr. When dry it is laid, face down, upon a board covered with black velvet and exposed to light till, on applying a wet finger, the portion in immediate contact with the plate is found to be insoluble. About ten minutes in the shade generally suffices. The next operation is to coat with gelatine.

First Gelatine Coating.

The gelatine used for this purpose is a special kind, very soluble.

Gelatine	160 grammes.
Bichromate of ammonia	30 ,,
Water	2400 ,,

In dissolving the gelatine (in the usual well-known manner), see that the temperature of the solution is kept under 100° Fahr. This gelatine is applied to the plate in a peculiar manner. Holding the plate level with the left hand, a quantity of the solution is poured on the surface at the end next to the left, and guided zigzag to the other end by the forefinger of the right hand bent at a right angle—the side of the finger being employed. The plate thus coated evenly is placed in the drying box for from ten to fifteen minutes, the temperature of the box being 110° Fahr. When dry it receives a

SECOND COATING WITH GELATINE,

Prepared thus :—

A.

Gelatine	75	grammes.
Water	1000	,,

B.

Fish glue (isinglass)	75	grammes.
Water	1000	,,
Bichromate of ammonia	18	,,

It is necessary to dissolve A and B separately on account of the necessity for *boiling* the fish glue for some time, in order to its being properly dissolved. When this takes place, mix the whole together, including the bichromate. This forms a stock solution, to use which mix, *on the day of using*, of

The above stock solution	100	grammes.
Chrome alum solution	2	,,

The above-mentioned chrome alum solution is composed of—

Chrome alum	10	grammes.
Bicarbonate of potash	2	,,
Water	200	,,

First dissolve the alum in 80 grammes of the water, using heat; add the bicarbonate of potash, then the remaining 120 grammes of water. The bicarbonate of potash must have been dried.

The above is applied in the same way as the first gelatine coating, and also dried in the same way. See that the door of the drying chamber is not opened till after the plate has been in it twelve minutes.

After the gelatine has dried, see that the plate is cooled *gradually*, and not taken out suddenly into the cold—reticulation would ensue if this were done.

Note that the grain of the printing surface is influenced by the latter coating of gelatine—the thinner the solution, the finer the grain.

Quick drying of the first coating, as well as of the second, conduces to coarseness of grain and, therefore, to facility of printing. Slow exposure in a weak light under the negative also favours coarseness of grain. The quicker the exposure the finer the grain, but the greater the care and skill in printing.

The exposure under the negative, in the shade, is from ten to fifteen minutes.

After exposure the plate is immersed in plain water until all colour has gone.

If the printing surface be judged to be too soft, harden it by an application of nitrate of lead.

If a very fine grain be desired, print in the sun.

If the negative has been a hard, intense one, after removing the plate from the printing frame, flash the plate in the diffused light for a few seconds.

The printing plates, prepared as above, are now supposed to have been dried and stored away ready for use.

To print from one of such, immerse it in water for fifteen minutes, then wipe with a sponge, and sprinkle the back with spirits of turpentine, when immediately lay it down on the strong glass bed of the lithographic printing press.

INSTANTANEOUS EXPOSURES.

By W. Jerome Harrison, F.G.S.

What is an 'instantaneous' exposure? I propose to define it as any exposure of less duration than is perceptible by the eye, *i.e.*, less than one-eighth of a second. As it is not possible to uncap and cap a lens in so short a space of time, it is necessary to replace the lens cap by some mechanical contrivance, which we call a 'shutter.'

In my own practice I have entirely dispensed with a lens cap, instead of which I use for general purposes a Place's shutter. This is of the simplest construction, perfectly light-tight, and admits of exposures of any duration down to about one-tenth of a second. It has also the great advantage of allowing any difference of exposure which may be desired to be made between the sky and the foreground (thus affording natural clouds in the negative), or between one side and the other of the picture.

For still more rapid work, such as 'diving,' 'playing leap-frog,' &c., where exposures of from one-twentieth to one-fiftieth of a second are necessary, I have found the Grimston shutter all that can be desired. My 'Grimston' is fitted with removable diaphragms, $\frac{f}{8}$, $\frac{f}{11}$, and $\frac{f}{16}$, and I most frequently use the second and third of these. The smaller the diaphragm the less the light it is true, but the greater the probability of getting the subject in good focus. Now, at the seaside, for example, during the summer months, the light from eleven to one is amply sufficient to allow of $\frac{f}{16}$ being used when either the Derby extra rapid or Fry's sixty-times plates are employed.

One of the crucial points in using very rapid plates is to keep all extraneous light away from them, both in dark room and dark slide and in the camera. If the plates don't 'fix out' with perfectly clear margins, the light of the dark room is probably at fault. As a developer, no doubt, pyro-potash is good; hydrokinone-potash possibly better. But for my own part I stick to pyro-ammonia. It is a good plan to give the plates a preliminary washing in a very weak alkaline solution, say, ten drops of ammonia to ten ounces of water. Then rinse in plain water and apply the developer. Commence with a weak developer, say,

Pyro	3 grains.
Ammonia	½ minim.
Ammonium bromide	¼ ,,
Water	1 ounce.

If no image appears after two or three minutes, add another half minim of ammonia, and repeat the dose of alkali a third and a fourth time as required; with the fifth half minim of ammonia add another quarter minim of ammonium bromide, and continue development. In this way ammonia may be added up to the point which it is known the plate will bear—the fogging point, as we may term it. This varies for different plates, but a plate suitable to the work ought to stand six minims of ammonia per ounce. The developer at the end of the operation will then be:—

Pyro	3 grains.
Ammonia	6 minims.
Ammonium bromide	$\frac{3}{4}$ minim.
Water	1 ounce.

To be convinced of the value of this method of slow development two plates from the same batch should be exposed on the same subject under precisely similar conditions. Let the first one, A, be developed in the manner described above, which will require, perhaps, from fifteen to twenty minutes; then develop the second plate, B, in the completed strong developer; it will be finished in perhaps three or four minutes. Now, my experience is that A will invariably be a much better negative than B. In conclusion, let me say that the best 'instantaneous' pictures are those which have been previously carefully arranged. The distance measured and the focus adjusted, the models are practised in their work—diving, leap-frogging—whatever it may be; then the exposures—not one, but half-a-dozen—are made, and the best negative finally selected. Again, don't despair when you see the magnificent results exhibited by M. or N.—*you don't see their failures.*

Practice instantaneous work, then:—

(1), At the right time of the year (April to August); (2), at the right time of the day (from ten to two); (3), only in a good light, such as you get at the seaside or in the country after rain, and keep the sun over either your right or your left shoulder; (4), with suitable plates—the Derby extra rapid and Fry's sixty-times I know to be splendid, but there are plenty of good makes if you pay a fair price; (5), with a doublet lens working down to $\frac{f}{8}$—either Dallmeyer's rapid rectilinear or a Beck's autograph works splendidly; (6), with a suitable shutter fitted with pneumatic ball.

There are several other points connected with the subject to which I wanted to refer, but my communication has already become too lengthy, so I will leave them for 's'mother evening.'

A LIFTER FOR DRY PLATES.

By J. T. Hackett.

Some dry plate manufacturers send out their plates in light-tight grooved cardboard boxes, which are very convenient and portable, but have one defect, which is the difficulty with which the plates can be removed from them.

The following contrivance I have had in use for some time, which will be found to overcome this difficulty in a cheap and effective manner.

Procure a piece of black tape about one inch wide, and about two inches longer than the box measures inside from end to end, and twice its depth. Now sew or otherwise fasten one end of the tape to the centre of the top of one of the ends of the box, then hold the other end of the tape in the left hand, and slide a plate into the groove nearest to the end you fastened the tape; the weight of this will carry the tape to the bottom of the box at that end. Now put a plate into the other end of the box, which will cause the tape to lie upon the bottom of the box. Now fill up the box with plates, and fold the over length of tape over upon the edges of the plates nearest to it, and it is ready for use. If preferred the tape can be fastened to the centre of one of the ends, close to the bottom of the box, which will answer just as well as the above method, but will not be so easy to do. The tape need not be so long if the latter plan is adopted. If the last plan is used and it is thought necessary, a piece of black, red, or orange paper can be glued over the part to which the tape has been fastened, to prevent all chance of light getting at the plates. This will, however, be quite unnecessary if the first plan is used.

When a plate is wanted, take hold of the end of the tape mentioned above and pull it gently, which will raise the plates any required height, and they can be easily removed with the thumb and finger.

A similar arrangement to the above will be a very useful addition to wooden, ebonite, vulcanite, or *papier-mache* developing trays or dishes, for raising the plate when required during or after development.

ORTHOCHROMATIC PHOTOGRAPHY.

By W. H. Hyslop.

A year ago we heard a great deal about orthochromatic photography. We saw and admired the results of Dixon and Gray's process; we were promised grand results by other processes, but our promises have ended in simply nothing; and why? One reason, I suppose, is, that one branch of experiment was strangled in the hope of a monopoly, and workers were afraid of the law courts.

It is true that during the past twelve months we have had lots of theory, but what avails theory when at our exhibitions nothing is exhibited showing the practical value of the process, excepting, of course, pictures by Dixon and Gray?

That it has a value, and a great value, I fully believe, and I commend this line of experiment to so many amateurs who have leisure to investigate it; but, for any sake, don't let us have so much theory. Get good results, then show them to others, and then publish in the journals how the results were got.

LEVELLING CAMERAS.

By G. L. Addenbrooke.

Experienced workers have for a long time strongly recommended the addition to a photographic outfit of some means of levelling the camera when it is employed for taking views of architectural subjects, or subjects in which straight lines of any length occur, or where it is of primary

importance to render the perspective with as much accuracy as may be. Various rough-and-ready methods of doing this have been proposed, such as a string with weight attached laid against any vertical part of the camera, looking at the horizon along the tailboard of the camera, both towards the front and sideways, and getting the base of the camera to point directly both ways to it. This is a correct method, but tedious at best, and only practicable when the horizon itself is visible, or where the view extends for a considerable distance. Another more workmanlike and favourite plan is to attach a small plumb-bob to the side of the camera somewhere, partly let into the woodwork. It hangs plumb with the face of the woodwork when the camera is level sideways, and a small scale indicates how far it inclines forwards or backwards. But in my opinion all these methods are clumsy and wasteful of time in comparison with the use of a spirit level. There are various ways in which spirit levels may be used for levelling cameras. A small one of the common straight type may be carried in the pocket or camera case, and laid on some part of the camera longwise; and when the level is got in that direction, it may then be put crosswise and the operation repeated. The objections to this method are that the level is loose. Consequently it may be forgotten and left behind on some important occasion, or it may be dropped inadvertently. Further, when the camera is horizontal in one direction, this level is apt to be thrown out while levelling in the other direction at right angles to it.

An improvement on this method is to use a small circular level, which can be placed on any flat part of the camera. By the direction in which the bubble lies in this with regard to the centre, it is easy to see in what direction the camera wants moving to bring it horizontal, and thus the operation is reduced very nearly to one movement instead of two. The loose circular level, however, is of course liable to the same objections as the loose straight level, as far as portability and liability to breakage is concerned; and, moreover, it has this further disadvantage that, being made of a brass case with a glass top let into it, instead of being an hermetically sealed glass tube as in the straight pattern, it is very difficult with varying temperatures to keep the joint between the brass and glass perfectly tight, and there is consequently in most levels some tendency to leakage and consequent destruction of the level.

A third alternative consists in having the levels permanently attached to some accessible part of the camera. This can be done either by having two small straight levels let into the wood of the tailboard, flush, and at right angles to each other, which for the reasons given above perhaps makes the most permanent job, or a small circular spirit level may be employed. As long as it lasts, which should certainly be a very considerable time, this latter method is all that can be desired, and as the level is not an expensive article it would not be very difficult to replace it should it leak badly. There is, however, much less tendency for a small circular level to go wrong when fixed to a camera than when carried in the pocket; because in the former case it is subject to much less extensive and rapid alterations of temperature than in the latter, and the brass and glass consequently expand and contract together more equally.

I had a level of this latter class about seven-eighths of an inch in diameter let into the tailboard of my camera some months ago, and have

used it constantly ever since. It has given me the greatest satisfaction throughout, and I must say that until I began to use it regularly I had no idea what a benefit it really was. The chief point in choosing and fitting a level of this class is to see that its action is rather coarse and quick, for which purpose the under side of the glass should be slightly concave. This gives perfect accuracy for photographic purposes, whereas a very finely adjusted level is difficult to set quickly on uneven or soft ground with such rough means of adjustment as the camera legs afford.

The advantages of the use of a spirit level for architectural work are so well known that it is not worth while staying to point them out. For landscape work they are perhaps less obvious, but none the less important. Only those who have attempted to level by the eye on uneven or sloping ground, when the horizon is not clearly visible, can properly appreciate the difficulties of doing so; by means of the level this is done at once.

It may be asked if it is of any importance to get the camera level for the majority of landscape work. Personally I think it is of great consequence. If the camera is out of level sideways, the resulting picture will come diagonally on the plate; and in the print you must either submit to the view being out of the perpendicular, or the print must be trimmed down and part of the plate wasted. On the other hand, if the camera inclines either backwards or forwards, the position of the horizon line in comparison with the foreground and middle distance is thrown out, truth is sacrificed, and very often the perspective greatly altered. Therefore, I say to all who value convenience and truthfulness in their work, do not hesitate to get a level attached to your camera before the coming season.

SIMPLICITY AND EFFICIENCY IN PICTURE MAKING.

By Rev. B. Holland.

As the great object of photography in the amateur's hands is the production of pictures, either to serve as reminiscences of spots visited or to show evidence of artistic skill, it has always seemed to the writer that the fewer perplexities connected with the manipulations the better. The less cumbrous the preparatory stages the more likely the attainment of final success; and as the completed picture is the main thing to be considered, it matters little what method is employed to obtain it. Complicated cameras and a huge battery of lenses may easily be dispensed with, and expensive plates discarded. The following is my own mode of working, in brief, and it leaves little to be desired:—For a camera I use a rectangular box (dimensions for half-plate twelve inches long by eight inches square), the front sliding up and down in grooves, and the back furnished with a light-tight sleeve having an elastic and button to secure round the wrist. Just inside the sleeve an oblong hole is cut in the bottom, and to the hole a bag is fixed to carry the plate box, this box being made of stout card with drop-over lid large enough to carry about a dozen plates. A frame the exact size of the plate is made to slide in the front part of the camera by means of a thumbscrew passing through the top and adjustable from the outside. The focussing glass, which is loose, and the plate are held in the frame by a spring, and it is easy to focus and adjust plates with one hand

through the sleeve. The plan is simple in the extreme and perfectly effective.

The plates for landscape work are made by the following formula, and let none despise them before giving them a trial :—

No. 1.

Silver (ammonio-nitrate)	40 grains.
Water	6 drachms.

No. 2.

Gelatine	20 grains.
Potash bromide	30 ,,
,, iodide	15 minims of a solution containing 5 grains to a drachm of water.
Water	1 ounce.

No. 3.

Gelatine	2½ drachms.
Water to soak...........................	6 ,,

Mix Nos. 1 and 2 at 130° Fahr. and cook in sinking temperature for twenty minutes, stirring well every five minutes; then add No. 3, stir till dissolved, set, and wash. The completed emulsion after washing should measure under six ounces.

One of the best developers for the plates will be found in the ALMANAC for 1887, page 140, under the heading 'Scientific Development.' These plates are very rapid and require but little pyro in the developer, while, with careful treatment, they yield negatives not inferior to plates containing a much larger quantity of silver, or those sent out by our best makers.

Working on the above, or any similar easy plan, one has the satisfaction of saying truthfully when showing results, 'These pictures are *my own* work,' an assertion which, since the good old days, has not always been made with strict accuracy.

GOOD AND FREE VENTILATION IN THE DARK ROOM, AND DRY AIR, FREE FROM DUST, FOR THE DRYING OF GELATINE PLATES.

By Prof. E. STEBBING (Paris).

HOPING to be of some service to the profession, as is my wont, I send on, for the ALMANAC of 1888, an easy and sure means of obtaining, without costly machinery, free air for the developing room without the admission of light. Very much has been said by doctors and others on the necessity of providing, if not pure, at least a free distribution of air to our operators, that I think it not unwise to describe the method I have employed for many years in my laboratories at Paris.

The upper pane of glass is taken out of the lower sash of the window, and a zinc box is made long enough to cover the place void of glass and the lower pane as well. The upper half of this box is open and adapts itself to the hole from which the pane of glass had been taken out. Diagrams 2 and 3 show the form and position of this box inside the room,

Diagram 1 as seen from the outside of the house. I will now endeavour to describe its make and its advantages:—

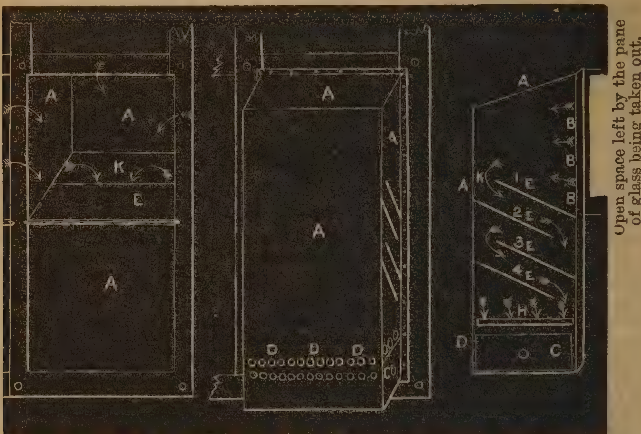


Diagram 1.—Window sash. View from outside, showing zinc box.

Diagram 2.—Window sash. View from inside drying room, showing apparatus.

Diagram 3.—Side view of apparatus, showing position of sloping partitions, which allow a free inlet of air and exclude light.

A A.—A zinc box closed at every part, excepting at B B B.

B B.—Opening to admit air, over which it is advisable to stretch a piece of canvas.

C.—A galvanised iron drawer the whole length and width of the bottom of the box.

D.—Series of holes to admit air.

E E E E.—Four separations, so placed as to let in the air and prevent the ingression of light.

H.—A wooden frame, caned as a chair, as long and as wide as the bottom of the box.

When fixed in window, the air enters at B, follows the direction of the arrows, goes down at K, passes over the caned frame at H, and gets out at D.

Now, if dry air be wanted, the frame H is covered over with calcium chloride. The air passing through this chemical is not only dried, but attracts all kind of dust or anything which may be floating in the air. I forgot to say that I generally lay a piece of canvas on the caned frame, as the holes are a little too large.

In a very short time the calcium chloride begins to dissolve by absorption of damp and falls into the iron drawer. More calcium salt is placed upon the frame, and so on until the drawer has received a certain quantity of the deliquescent salt. This is put into an iron tray and left

in the oven until dry; it is then placed upon a brisk fire, which not only drives from it all moisture, but burns and destroys all dust which had been collected. This calcium chloride need never be thrown away, but can be used over and over again. I can only add, try this system, and you will be contented.

In wishing the readers of the ALMANAC 'A Happy New Year,' I give them this advice, which is worth its weight in gold: Never insure your property in a French Assurance establishment, being myself a victim of their bye-laws.

A CHAT ABOUT DEVELOPMENT.

By W. CLEMENT WILLIAMS.

I HAVE always been an advocate for slow development, and after some years' practice am convinced it is the 'right thing' to ensure bright and sparkling negatives, possessing a good range of half tone, roundness, and atmospheric effects. Quick development, I believe, favours the opposite in results, and the possibilities of the plates so treated are not brought out to the utmost; much depth of tone seems to be lost, and a proportionate hardness and flatness substituted, the latter being particularly observable when the plate is developed well through to the back of the film, which I think ought always to be done if there is any 'pluck' to be looked for in the pictures.

In a quickly developed plate I believe the surface of the film is attacked *too energetically* at the *commencement* of *the development*, and the surface rendered hard and somewhat insoluble or non-porous, preventing, to some extent, the equable action of the developer at the back of the film, and when the plate is placed in the fixing bath, though apparently fully developed, loses much of its pluck and gradation.

I mix a developer as follows:—

No. 1.

Water	8 ounces.
Liquor ammonia	1 ounce.
Bromide of potassium	140 grains.

Call this stock solution No. 1.

No. 2.

Water	8 ounces.
Pyrogallic acid	1 ounce.

For use take—

Water	8 ounces.
Solution No. 1, ammonia	½ minim.
Solution No. 2, pyro	1 drachm.

Gradually increase the strength of developer as the development proceeds by adding another half minim of No. 1 solution and half drachm of No. 2 solution. The developer will now begin to be discoloured, if not badly so, for the operations up to the present addition should have taken at least five minutes. I do not favour the addition of sulphite of soda or acid of any kind for the purpose of keeping the developer clear, because the discolouration of the developer is to me, in slow development, an indication of exhausted energy, which I remedy by a fresh mixed solution,

and also because I can prevent the staining of the film by the following simple expedient :—

After pouring off the discoloured developer, wash the plate, and then soak in—

Water	10 ounces,
Methylated alcohol	2 ,,

for a few minutes. Although perfectly clear at this stage, it is astonishing how soon this becomes as dark coloured as the developer was, in consequence of *the extraction from the film* of every trace of discoloured and spent developer. I place great importance upon this being effectively accomplished ere the freshly mixed developer be applied. A new lease of life seems thus to be given to the development every time this is done. I have often known plates that have been under exposed, and have obstinately refused to develop further, gain in strength rapidly under this treatment persevered with time after time.

If this is not done the film becomes saturated with developer, that, from its intimate contact in the film, is soon exhausted, and *should be removed*, to allow of the full energy of the remainder of the developer having access to and in the film, and the action continue unretarded.

To return to the application of the developer. The solution is gradually strengthened until the developer contains one and a half minims of No. 1 to eight ounces of water; beyond this I never go with ammonia bromide solution. The pyro solution, No. 2, is kept to one and a half drachms to the eight ounces quantity until all the detail is out, then I add it by the minim until full density is obtained—say up to four drachms of No. 2 to the above quantity if it is an obstinate case of under exposure.

I have spent an hour on one plate as above in the case of *very short exposure*, and then obtained a good quality of negative, clear and bright, in spite of this long time.

I have also got good results with very short exposures by applying one drachm of No. 2 to every ounce of water, after washing off all developer and *no* ammonia bromide solution, and after applying for some minutes dilute with water to two ounces to the drachm, and *then add* the ammonia bromide solution, this operation being repeated if necessary. Upon the very strong plain pyro solution being applied, a marked change for the better is at once observable.

Again, I have been able to force an under-exposed plate by using a *warm developer*, methylated alcohol being used to take the place of water.

I have often heard complaints of frilling that no alum or tannin baths could stop. A developer mixed with methylated alcohol will succeed, I believe, when *nothing else will.*

AN EASY AND EFFECTIVE METHOD OF PRINTING CLOUDS TO LANDSCAPES.

By George Smith (Dudley).

The usual mode of printing clouds to landscapes from a separate negative is generally a tedious and unsatisfactory operation, and those who have attempted it can testify to the skill and care which are required to produce really good results. Even then the number of prints which are

spoiled before a satisfactory print is obtained is only known to those who have had their temper tried by repeated failures. One of the greatest difficulties in the printing-in of clouds is to prevent a sort of halo or border of light showing at the junction of the landscape with the sky, or round any object which may project into the sky. The more deeply the clouds are printed the more decided becomes this border of light, and the more unnatural the effect produced. Some persons endeavour to avoid this by printing-in the clouds very lightly—little more, in fact, than suggestions of them—and if sufficient care is taken in the masking the result is fairly good. It is, however, rare to find a case in which you cannot tell at a glance whether the clouds have been taken at the same time as the landscape, or whether they have been printed-in afterwards. During the past autumn I made experiments with the object of making the printing-in of clouds easier and more effective, and I think I may venture to say with some success. The following is the plan I have adopted. Having obtained a print in the ordinary manner to which it is wished to add clouds (of course it is understood that if the sky in the negative is not sufficiently dense to print perfectly white it must be blocked out with black varnish), take a sable or camel-hair brush and with some opaque water colour paint over the landscape about an inch downwards from the horizon, carefully covering over those objects which project into the sky, and keeping rather *within* their edges than outside, as every bit of the colour outside will show as a white mark in the finished print, even if the edge is gone over but slightly. It is best to begin at the junction with the sky, and having got the outline there exact, the lower part can be smudged on quickly. I find Rowney's flake white water colour in tubes answers well and does not affect the silver in the print, but, no doubt, other body colours would do equally well. The colour having dried, the print is placed under a cloud negative and printed in the usual manner until the clouds are deep enough. No care is required, and the landscape or projecting objects being protected by the layer of colour, the clouds will print right up to their edges without a perceptible joining. This gives a natural effect, the clouds appearing to go behind the objects, thus giving an idea of space and atmosphere. The first washing water in which the print is placed will remove the colour, and the print can then be toned and fixed in the usual way.

Although by this method clouds may be printed deeply, yet it is, as a rule, inadvisable to do so on account of the heaviness which it produces in the print. The negatives of the clouds may be either on glass or paper; the latter (which can be purchased from several firms when it is inconvenient to make your own) being particularly handy for the purpose, as they can be arranged on the print far more easily than those on glass, and they have the further advantage that either side can be used without loss of sharpness. I have, however, found that they are liable to become covered with small transparent spots, caused, the makers say, by their having come into contact with some acid, but, in my own opinion, due to imperfect fixing. Whichever kind may be used, it is well to get them a size larger than the print, as this permits of them being moved a little to either side, upwards, or diagonally, so that the portion may be used which best harmonises with the picture. Although it is a little trouble to apply the colour to each print, yet there is really a saving of time, as no care is afterwards necessary in moving the masks, cotton-wool, &c., usually

employed, and which becomes a very tedious matter in dull weather. I think this method will be found useful in other cases of double printing where it is wished to preserve the lights; for instance, in portraits or figures such portions as may be wished can be preserved, while the rest may be sunned down. It would also appear to be useful in platino printing, where, in consequence of the faint appearance of the undeveloped print, some difficulty must be experienced in placing the cloud negative in its proper position. As, however, I have not done any printing by that process, I must leave this point for others to determine. I have no doubt that the method I have here suggested may be improved upon, but I think the lines I have indicated show a departure from the ordinary methods adopted in the printing-in of clouds.

HOW TO GLAZE ALBUMEN PRINTS WITHOUT APPARATUS.

By J. Leisk.

The following may be nothing new, but as I find no reference to the process as applied to albumen prints in any handbooks I possess, it may prove of use to those who do not possess a rolling or burnishing apparatus, and who do not care to attempt enamelling.

Thoroughly clean a sheet of common glass, of size to hold several prints, and see that it is free from scratches, &c.; then dust it liberally with powdered French chalk, and with a soft pad rub the chalk all over and *into* the surface of the glass. Do not polish off the chalk, but after *rubbing in* dust off the loose chalk with a soft brush or dry handkerchief. The glass is now ready.

Next take the prints direct from the washing water (they must not be drained or dried in any way since fixing), and place them face downwards on the prepared surface of the glass; cover with several folds of blotting-paper, and over all a piece of stout paper, and rub well down with the palm of the hand until the prints are thoroughly in contact with the glass and all air specks expelled, care being taken that the prints do not move on the glass during this operation. The glass is now placed with the *backs* of the prints upwards before a bright fire, on the top of a stove as hot as the hand will bear, or (in summer) in a window exposed to hot sunshine, and as soon as dry the prints will leave the glass of their own accord, and be found to possess a very fine surface.

Any ordinary sensitised albumen paper that I have tried can be glazed as above, provided it be not too old, and that the *drying is rapid*, for if left to dry slowly the prints are apt to adhere to the glass, when nothing short of scraping will remove them. A glass carelessly cleaned, or a short supply of French chalk, may lead to failure.

Owing to the heat required for drying, these prints cannot be mounted while on the glass like the gelatino-bromide prints, and as water dulls the gloss, a mountant free from water, such as indiarubber solution, must be used if the full surface is to be retained; but still a good half gloss like a rolled print can be had by using thick starch paste, but a much finer surface can be got by the following :—

Soak an ounce of refined gelatine in *cold* water for an *hour*, then drain off and squeeze out the water as much as possible; put the gelatine in a jelly pot and place the latter in a pan of hot water on the fire. When the

gelatine has melted stir in slowly two and a half ounces of *pure* methylated spirit, and bottle for use. This glue will keep indefinitely, and can be melted for use in a few minutes by standing on the hob or in a basin of hot water. As it contains a very small percentage of water, it hardly affects the gloss of the prints, and it dries almost immediately.

THE THREE ALKALIES.

By W. Hanson.

Ammonia, soda, and potash. The best of these, in my developing experience, is potash—in the form of carbonate, of course.

The first is objectionable on account of its volatility, notwithstanding all its good properties. The second, though fixed, and therefore always to be relied upon, has the unfortunate tendency to occasionally stain the gelatine film yellow, and for this reason alone the third is to be preferred, because of its freedom from that fault, while sharing all the good qualities possessed by the other two.

The following is a good working formula :—

Carbonate of potash	1 ounce.
Sulphite of soda	2 ounces.
Bichromate of potash	20 grains.
Water (cold)	4 ounces.

This stock solution will keep for months. For present use dilute two drachms of the above with sixteen ounces of water, and to every ounce of this dilution required add from two to three grains of pyro, and bromide of potassium if needed.

Note.—As the carbonate gives out heat in dissolving, and the sulphite absorbs heat, it will be found convenient to mix the salts before adding them to the water, when they readily dissolve with shaking.

The addition of bichromate of potash was recommended by me about two years ago in a formula for soda development which I then published in The British Journal of Photography, and of its utility I have now no doubt, whether mixed with soda or potash.

THE APPLICATION OF THE GRAPHIC METHOD TO PHOTOGRAPHY.

By H. J. Gifford.

The use of the graphic method for photographic work does not seem to be much used, and it seems to me that it is always a good check to experiments; not only that, but we could carry all the data of the ordinary exposure tables on one small sheet of paper instead of a collection of different tables. Not only that, but by using the 'section paper,' *i.e.*, paper ruled in squares, which may be got almost anywhere now: a parallel ruler and a pair of dividers, we can do almost all mathematical and arithmetical problems, such as multiplication, division, squaring and cubing, differentiating, and integrating, without putting down a figure. We are now all getting used to the ordinary curves, such as are issued daily by the Meteorological Office, and for registering which photography

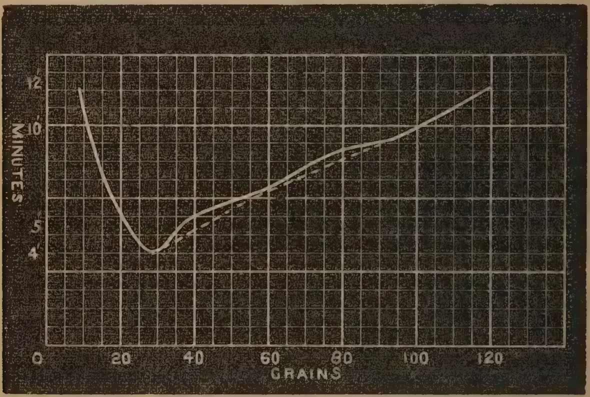
is so much used. To show the use of curves for checking experiments I have taken an experiment out of *Hunt's Photography*, and which may be found on page 60 of the edition published in 1857 with relation to printing. He gives the following:—

120 grains of salt to an ounce of water took to whiten the paper	12 minutes.
100	10	,,
80	9	,,
60	7	,,
40	6	,,
30	4	,,
20	6	,,
10	12	,,

These I have plotted on a bit of section paper which I had beside me. Though of course the scales are perfectly arbitrary I took

Vertical scale time .... 6 mm. = 1 minute.
Horizontal scale grains .... 1 mm. = 1 grain.

The resulting curve from this is the full line. We see that thirty grains gives the best result, and as we diminish the amount of salt we lengthen the time of exposure, which gives a curve that is a hyperbola, but as we increase the salt we get an irregular curve. This appears to me to be wrong, and ought to be a hyperbola, only much weaker than the other: I have sketched in what I should say was a more correct curve by a



dotted line. I can only here give the slightest idea of what curves might be used for, as I think they might be used for almost everything, and can only hope that the hint of employing curves for experimental work may save the trouble of some experiments. As three points on a curve give you an idea of the curve, though as you cannot complete it it may not be a correct one, as it does not show you at what point of the curve it is.

I also think that if you get an irregular curve, as the one I have above, you will find in practice that there is some cause which you have over-

looked in your experiment. I think that emulsion makers would find a curve for the time of boiling advantageous.

As the curve has been reduced the scales are incorrect, though in the original the small divisions are 2 mm. square.

EXPOSURE TABLES AND DEVELOPMENT FORMULÆ.

By C. H. Bothamley, F.I.C., F.C.S.

Exposure and development are such well-worn subjects that it seems almost impossible to say anything new about them; but exposure and development are still more than half the battle in the production of a successful photograph, and hence the following remarks may not be without some value, especially since they are addressed, in the first place, to amateurs who are either beginners or have only a limited experience.

A certain friend of mine, who cannot be accused of want of culture, is in the habit of inveighing strongly against what he terms 'learned rubbish,' by which he means productions that may serve to illustrate the great knowledge and perseverance of their producers, but have very little value as methods of investigation, and do nothing for the development of the intellect, the improvement of the morals, or the increase of the happiness of the human race. If my friend were a photographer, I am afraid, with all due respect to their authors, that he might in his haste put 'Tables of Exposures' into the category which excites his ire. During the past year there has been considerable discussion concerning the mode of using such tables, and the relative merits of those constructed by various authors, and it seems advisable to consider how far they have any practical value. Truly the time and trouble expended in their compilation must have been enormous, and the methods of using them are not characterised by sweet simplicity. Ascertain the intensity ratio of the stop used, multiply by a factor, appraise the character of the subject, and then add, subtract, multiply, or divide (as the case may be) by a 'subject number,' make a correction for the season of the year and the time of day, and then expose—but, alas! the light has changed, the effect is gone!

In the first place, it cannot be too strongly insisted upon, as every chemist and physicist knows full well, that extended numerical tables are of no real value unless they deal with conditions and quantities which are constant. Now in the exposures of gelatine plates there is not a single condition which is really constant except the apertures of the lens! The rapidity of the plates varies in different batches, nay, even in different plates in the same packet; the character of the light varies from place to place, and from hour to hour—not unfrequently from minute to minute; the character of the subject varies still more widely; and the exposure required depends upon the effect which the photographer wishes to produce, and the method of development which he is going to use. All these conditions vary widely, and at present at any rate do not admit of quantitative estimation. How, then, is it possible to work them into tables which have any claim to accuracy? How many photographers at all worthy of the name ever make their exposures by means of the tables which have been constructed?

It has been stated that exposure tables are intended chiefly as an aid

to beginners. A very brief and simple table might have some value from this point of view; but those now in existence are far too complicated and extensive, and bewilder the tyro by their very complexity. Moreover, they tend to give the impression that proper exposure is only to be ascertained from tables, and not, as is really the case, by observation and experience.

What, then, is to be taken as a guide to exposure? I answer, The apparent brightness of the image on the focussing screen after the stop has been inserted, special attention being given to the dark parts of the subject, and some allowance being made for the time of year and condition of the sky. Doubtless this is not very easy, and requires both care and skill; but in photography, as in everything else, there is no royal road to success. At any rate, all troublesome and complex calculations are avoided, and it must be remembered that the use of exposure tables involves an estimation of the character of the subject, or the intensity of the light, or both, which is at least as difficult as the estimation of the brightness of the image on the screen. But how is the beginner to learn the connexion between the brightness of the image and the exposure required? By his own observation; by selecting a subject of more or less typical character, carefully observing the character of the image on the screen, and then exposing different parts of the same plate for different lengths of time in the well known and often described manner. After development and fixing he can then observe which exposure has given the best result. Let him do this carefully with three or four subjects, and he will not only gain more knowledge about proper exposure than any number of tables can give him, but he will also learn what is equally, if not more, important—the way in which a plate behaves in the developer according to the amount of exposure which it has had. A knowledge of the variations in the character of the light with the seasons and atmospheric conditions, can only be learnt by experience, though a certain amount of information can be got by the use of a simple form of actinometer, in which the time required for a piece of sensitive *bromide* paper to darken to a standard tint is observed, but it is advisable to dispense with encumbrances of this kind as soon as possible. Complicated actinometers, like complicated tables, are, in the writer's opinion, delusions and snares. After all, the secret of success lies not so much in the amount of exposure, provided that it has not been too short, as in the development of the image. Take care that the *exposure is sufficient* and learn to *develop properly*.

Learn to develop properly! That's the rub. 'I can teach any one to make a plate, but development is an art,' said one of the leaders in modern photography. How many photographers out of the great army of dry-plate workers ever do learn to develop properly? and how many have any conception of the control over the result which a rational method of development gives? Developing formulæ are already legion, and their number still increases. How many have any real value? Most of them differ mainly in the relative proportions of pyro, alkali, and restrainer, and the differences after all are not very great. As a rule, a new formula is put forward with a sort of *ex cathedrâ* statement by the author that it is the best developer that can be used; but it is very rarely that any experimental evidence is quoted in support of the statement. Now I do not hesitate to assert that a 'new formula' which is

new only in so far as a slight alteration has been made in the proportion of the constituents, is of little or no practical value. When a proposed formula contains a new constituent that is another matter, but such cases are very rare. Moreover, when such formulæ are proposed, any evidence as to the advantage gained by the use of the new constituent is generally conspicuous by its absence. Where, for example, is to be found any tolerably complete series of experiments as to the relative advantages and deficiencies of ammonia, ammonium carbonate, sodium carbonate, and potassium carbonate, as the alkali in the pyro developer? It is true there are a number of isolated statements, supported by fragmentary evidence, but anything like a systematic investigation of the question is still wanting. Then, again, it has been proposed to use potassium ferrocyanide along with the alkaline carbonates; but I have never been able to learn what advantages were supposed to be gained by its use, or on what experiments any such suppositions are based. Further, beyond the fact that sulphites prevent, to a greater or less extent, the discolouration of the pyro solution, and thus tend to prevent the staining of the negative, is there not the greatest difference of opinion as to the advantages or otherwise resulting from its use? It is surely obvious that photographers with a taste for experimenting would do much greater service in the advancement of our art by *carefully* and *systematically* working out points like these, than by making trivial alterations in the relative proportions of the constituents of the developer.

It seems necessary even now to insist upon the fact that the best results cannot be obtained by rigid adherence to a formula. The relative proportions of the constituents of a developer must be altered to suit the character of the subject and the character of the effect which it is desired to obtain. In the first place, it is essential to have sufficient exposure to give all the details in the shadows without the necessity of forced development. Excessive exposure can be compensated during development; insufficient exposure is incurable. It must be borne in mind, however, that over exposure and under exposure are merely relative terms, and what might be called over exposure with one method of development will be correct or even under exposure with another method.

How is the beginner to know in what ways to modify his developer so as to obtain particular results? A developer almost invariably contains at least three constituents, each of which has its own particular function, namely, the *developer proper*, or density giver, *e. g.*, the pyro; the *accelerator*, *e. g.*, the alkali, whether it be ammonia or one of the carbonates; and the *restrainer*, *e.g.*, the alkaline bromide or citrate. In the first place, these three substances should be kept separate, and are most conveniently used in the form of ten per cent. solutions. In the second place, an experiment should be made to ascertain the maximum amount of alkali which an *unexposed* plate will stand without fogging in presence of, say, two grains of pyro per ounce and three grains of alkaline bromide. This gives a limit beyond which development cannot safely be forced. The great point, however, is to keep constantly in mind the respective functions of the constituents of the developer, and the chief effects produced by alterations in their relative proportions. These may be stated as follows:—

Increase of pyro produces increased density and contrast, with slightly less detail, and *vice versâ*.

Increase of alkali produces more rapid development, with increased detail and diminished contrasts, and *vice versâ*.

Increase of restrainer produces slower development, with increased contrasts but less detail, and *vice versâ*. An increased amount of restrainer also allows greater density to be obtained for the same amount of detail.

Dilution of the developer with water makes development slower, and tends to reduce the contrasts.

These statements likewise hold good, *mutatis mutandis*, for the ferrous oxalate developer.

It is scarcely necessary to indicate the way in which these facts may be utilised: that, for example, a subject with strong contrasts should have a somewhat long exposure, and be developed with a reduced amount of pyro and restrainer, but with an increased amount of alkali; whilst a subject with weak contrasts should be developed with increased pyro and bromide, but with a smaller proportion of alkali. Another point of cardinal importance, which is frequently ignored or neglected, is that the full amount of alkali should never be added at once, but in successive small portions, so that development proceeds tentatively, and the operator keeps the check hand over the development instead of letting it run beyond his control. It is only in this way that excessive exposure can be counteracted. *Let it be constantly borne in mind that* BROMIDE OF BRAINS *is the chief constituent in a developer.*

Doubtless development on the lines indicated is more difficult and requires more intelligence than the mechanical application of a ready-made solution, but the best results are not to be obtained without careful observation and intelligent practice. The more slavish the adherence to a formula, the more mechanically the process of development is conducted, the greater will be the number of failures; the more careful the observation of the progress of development, the more intelligently the developer is handled and modified to suit all the circumstances, the greater undoubtedly will be the number of successes and the nearer the approach to perfection.

THE PREPARATION FOR PRINTING OF GLASS AND PAPER NEGATIVES.

By Lindsay Hemery.

When the retoucher has a harsh negative, with dense high lights and empty shadows, one of his dodges is to affix a sheet of *papier minérale* on to the glass side of the negative. This serves a double purpose. First he will work out the dense lights with a dabber charged with vaseline or Canada balsam (thinned, perhaps, with benzole). This renders the *papier*, on the lights where applied, transparent, while the shadows remain protected by the ungreased portions of the *papier*. Secondly, the detail in these dark shadows may be further helped by working with stump and blacklead, or a soft lead pencil.

If the negative be of opposite character, viz., weak and flat, and lacking contrast, the *modus operandi* is reversed. Here we pick out the shadows with the vaseline, and strengthen the high lights by means of the blacklead.

But supposing that the negative be a proper film, the back of the negative does not require any *papier minérale*, there being a surface already equally adaptable to the double manipulation. Only, of course, the negative must be worked upon unoiled. There is one disadvantage, though of neutral character only. When we have a glass negative, should our 'dodging' not prove successful the *papier* can at once be torn off; but for a paper negative more care and trouble will be required. However, a little stale bread or indiarubber will remove the blacklead, while immersion in methylated spirit will take out the grease; or the local effect may be removed by oiling the entire surface.

Probably there are few paper negatives which could not be improved by greasing locally at discretion (when possible). For instance, many landscape exposures will show good natural clouds, but the foreground becomes fully printed before they are properly defined. Here, then, by greasing the sky portion only a more perfect picture would probably result. On the other hand are negatives where the subject proper is overpowered by a too heavily-printing sky; but here greasing of the foreground only would be indicated. Again, where halation exists, the detail might be strengthened by similar means. Church windows, tops of trees, &c., nearly always require some coaxing.

The operations indicated may demand some considerable skill to ensure a successful result, but the practice that makes perfect must be left to the diligent worker.

HYDROKINONE AS A DEVELOPER.

By Geo. Hadley.

Many are the formulæ published every year for alkaline pyro development; almost every amateur and professional has his own favourite one. Perhaps there is no better developer than the alkaline pyro, and to those that are getting good results I would say go on with it. But to others who have time and like to try something new I could recommend them to give hydrokinone a trial. I have used it for the last four years, and when I have had good plates it has been all I could desire. I believe one of the reasons why we have heard so little of this developer is that when it has been tried suitable plates have not been used, for there are only *three* or *four* makers' plates that can be successfully developed with hydrokinone.

My formula, which has not been published before, is as follows:—

No. 1.

Ammonia ·880	40 minims
Water	15 ounces.

No. 2.

Carbonate of soda (I use washing soda) saturated solution.

No. 3.

Hydrokinone	80 grains.
Water	10 ounces.
Citric acid	10 grains.

No bromide.

I use citric acid in preference to sulphite of soda for preventing discolouration of the hydro solution.

For use take 2 ounces of No 1; 20 minims of No. 2; 2 drachms of No. 3.

For over exposures use a drop or two of a ten per cent. solution of bromide of ammonium. The same conditions which govern pyro development hold good in the case of hydrokinone.

COATING DEVELOPING DISHES.

By C. Oakeshott.

One essential for the obtaining a perfect negative is a clean dish. For the smaller-sized plates nothing equals glass, as dishes of this material can be readily made chemically clean with a little strong acid. But for the larger sizes I take it that vulcanite or *papier-mache* is more generally employed as being lighter, less costly, and not so readily broken. A good plan to have these always in condition is to coat the inside with beeswax, paraffin, or ozokerit—candles of these materials can be had of any grocer. If found to be too soft a little resin mixed with either will give greater hardness, but this will be needed only in very warm weather. Dishes so coated are easily kept clean, but should a suspicion of retained impurity at any time arise it may be easily rectified by remelting the wax before a brisk fire, and placing the dish on a level surface till quite cold. I have dishes so treated which have been in use for many months, and they are in as good condition now as when first prepared.

PHOTOGRAPHIC ASTRONOMY IN 1887.

By Rev. S. J. Perry, D.Sc., F.R.S.

The great event of the year 1887, and which overshadows every other, as far at least as astronomy is concerned, was the Paris Conference, at which it was resolved to carry out the proposed plan of a photographic map of the whole of the sidereal heavens. Such a work must mark an epoch in astronomy, and there seems to be now no reasonable doubt about putting the plan at once most promptly into execution. France has already taken a leading part in the international scheme, and, if we include the colonies, England will be well represented shortly by the observatories of Greenwich, the Cape of Good Hope, Sydney, and Melbourne. A decade of years should suffice for the production of the photographs and for their reduction, and then photography will have put the world in possession of the most valuable result ever yet produced by observational astronomy. The possibility of such an undertaking is the immediate consequence of the recent progress in photography, and it would be hard to overestimate its practical effect upon astronomy.

The preparations for so great a work as the photographic record of all the stars visible in the most powerful telescopes on a uniform scale must necessarily occupy a considerable time. A very efficient committee of astronomers and physicists was formed to mature the plan and elaborate the numerous details which must all be accurately fixed before the commencement of the observations. But astronomical photographers need not in the meantime be idle, for the photographic chart of the heavens, however perfectly executed, will not supersede the necessity of procuring

enlarged photographic records of all the most important bodies in the universe. Some few of the brighter nebulæ and clusters of worlds were photographed before the present year, but 1887 has been adding rapidly to their number. Thus the nebula of Orion has become better known, and fresh nebulæ have been discovered in the cluster of the Pleiades. We are no longer dependent on drawings for the delineation of the cluster in Hercules, of the ring nebula of the Lyre, and of the dumb-bell nebula, and each fine night is now adding to our accurate knowledge of important celestial objects.

Some useful photographic results have also been gleaned in the far east of Europe during the total solar eclipse of August last, and these suffice to show how rich would have been the harvest had the astronomers received as bright a welcome from the Russian skies as they did from the hospitable friends who live beneath them.

IS IT SOMETHING NEW?

By Robert Offord.

Some temerity is required nowadays to answer such a question in the affirmative, and it is, moreover, a somewhat hazardous business; but as far as my knowledge and experience go, it is. And this is how it came about. It was necessary to add at the bottom of certain pictures some lettering in white upon a dense black ground, the letters to be a little ornamental.

Although generally speaking the old silver bath is still kept ready in the corner, it happened to be unfit for use at the moment. To write that which was required on cardboard, to take a negative on a dry plate with clear glass shadows, and to prepare carbon tissue and print and develop the same on glass, seemed to be a long way round to the desired end. Then the idea of employing Obernetter's method of obtaining reverse negatives seemed a good one, but experience has taught me that commercial plates have too much gelatine to silver upon them, and too much iodide to bromide, to give anything like clear results.

In my dilemma the following plan suggested itself, and proved to be just what was required. A few crystals of potash dichromate, with a fragment of lump sugar, were dissolved in water to make a strong solution. To this was added a trace of Chinese white, which gave a slight colour to the whole when stirred up. A piece of carbon tissue was then taken and fastened to a board, and the design drawn upon it with a pen dipped in the above. No need to write backwards, no negative taking or printing. The tissue was allowed to dry in the sun, and when dry was instantly wetted and squeegeed upon the right place on a clean collodionised glass. Upon development a negative was produced suitable for the purpose—to print in white letters upon a black ground. If what is known as transparency tissue be used, no further trouble is needed. If coloured tissue, it may be necessary to soak for a few minutes in a solution of potash permanganate to give sufficient density to the letters. After writing on the carbon, the whole process need not exceed half an hour in duration, which is perhaps even quicker than one wet plate in the copying camera, and the same in the transparency arrangement.

Writing on the tissue will be found to be very easy if a pen is use

that does not scratch, and the sugar will keep the solution moist long enough to soak through and make a dark deposit of pigment. The little white added enables one to see what has been written, and with the aid of a penknife and paint brush, erasures and corrections on the finished negative are simple enough. It is possible to do the same by means of a strong solution of chrome alum, but the deposit is never so thick, and the after intensification is absolutely necessary. The absence of sunlight only prolongs the process for a few minutes, when the result is precisely the same. Perhaps the brick-red tissue would be suitable for the purpose, but none being at hand, it could not be tried.

I should like to conclude by quoting an old formula for a substitute for collodion as a substratum on which to develop carbon where double transfer is not intended. It is a suggestion of Dr. Vogel, modified by Captain Abney, and can be used for carbon on opal or other glass, or for collodion emulsions, and is even recommended as a preservative for collodion dry plates. Briefly, it is gelatine dissolved in a small quantity of acetic acid by the heat from boiling water, precipitated by addition of methylated alcohol in sufficient quantity just to turn the solution white, and *re*-solution by dropping in acetic acid gradually and heating again. A grain of chrome alum in one drachm of water is added to every twenty-five grains of gelatine. The solution is filtered and used as collodion, the plate rocked, and dried by heat quickly to avoid dust. The result is a glassy, hard substratum, to which anything will stick. The solution will keep, as I have used it a year or more old, and so is always ready.

THE AMATEUR.

By Mark Oute.

Oh, yes! it seems quite easy, Jack, and it looks so very nice;
But think it over, my dear boy, ere you're landed on the ice.
When I first took the notion, Jack, all in the 'swim' then swore
'Twas but the drawing of a slide, cap off, and nothing more.
The descriptions were so glowing—'twas so easy to begin;
You know that I was strange to it, and, of course, they *let me in.*
All bunkum, lad, when you hear them say, 'You only have to get
A camera and lens, and things' (so *naïvely* termed a set),
'Then right away you'll pictures make as experienced workers do,
Where light, and shade, and beauty blend artistic'ly to view.'
It really can't be done like that; and men in every station
Must learn to take a picture well—it needs an education.

The holes and pitfalls on the road are manifold and many,
But experience will guide you on till there are scarcely any.
Not in a week, nor in a month, will you reach this blissful shore,
But by every failure overcome you're advancing more and more.
I only want to warn you, Jack, 'gainst those who'd have you think
That you can take a negative as easy's take a drink.
For I've been there myself sometime—all round; I ought to know:
So, unless you're going to study it, I would not have you go
Wasting your money and your time, thus throwing both away;
But if you're really on to learn, it's a glorious kind of play.
There is no easy, royal road for men in any station—
The taking of *a picture*, Jack, requires an education.

When first you start you'll find it hard to bear such things in mind
As caps and stops, and slides and drops, with a hundred more behind;
And when you really get to know their use and local standing,
Then Impatience in his eagerness exposures is demanding.
You make your first exposure, when you find, alas! that you
Forgot to put the cap on lens, with the plate exposed to view.
Then you get into a worry, and you get into a state,
As foolishly you find yourself with two pictures on one plate;
Or if an instantaneous shot at cattle, train, or ship,
You arrange your shutter nicely and watch the time to tip,
And when the ball you give a squeeze, my! won't you do a swear
When you see the lens quite open and the flap up in the air.

To lose your stops, or screw, or *head*, ere you are well begun,
Are but varied little incidents that go to help the fun.
Your sliding stand it won't go up; if up, it won't come down—
With it, like set of crutches, you wander through the town.
'And is there not a sip,' said Jack, 'of pleasure in the cup?'
Oh, yes! you've some successes, Jack, or else you'd throw it up.
You see, my boy, so many go in for an easy burst—
I thought that I would paint for you the beauty at her worst.
Then comes the darkened chamber, with measure, lamp, and tray,
And chemicals of many kinds with important parts to play.
The failures that will follow here I'll leave you to find and fight,
For they are deeds of darkness, Jack, and must not see the light.

But when the early fever's past, and you get settled down
To think on what you're doing, and each effort try to crown
With fair success, you'll give up fuss and gently move along,
Neatly arranging all your things; and when the light is wrong,
Instead of wasting many plates, you'll wait till it is right—
The time is past when *expose you must* in any sort of light;
You duly note the plates exposed with every when and how—
You've got to know your shutter, and it works quite easy now;
The chemicals you handle with that ease which knowledge brings;
To reduce, retard, develop, are to you familiar things.
This is the only royal road for men in any station,
So if you're going to join us, Jack, go in for education.

A USEFUL TOOL IN PRINT MOUNTING.

By Alf. Read.

Possibly some readers of the Almanac, in common with myself, may, in the course of their amateur attempts at print mounting, when rubbing with the 'common or garden' blotting paper the prints into contact, have experienced some such trifling annoyance as a torn or displaced print (generally the best of that batch), or had to hunt a blister over several square yards of a nearly finished print, only to find at the end of the operation that the print was too quite finished.

If there be any such I recommend a little article which an obliging shop lady called a blotting roller, and sold me into buying for, I think, 10*d*. Of course it was quite useless for the purpose for which it was

made, but as an accessory in the print-mounting department—well, I should smile! It consists of a small boxwood roller, covered with a good many even thicknesses of blotting paper, and mounted in a handle like a printer's inking roller.

First you 'adhesive' your print with your favourite 'mejum,' then lay it on the mount and persuasively pass the roller over its surface several times. The print will then adhere evenly and firmly up to the edges, all blisters vanish, no displacement and no rucking up or tearing of the moist print; in fact, mounting made a pleasure.

SPONGIO PILINE.

By Russell Sedgfield.

I do not remember seeing this mentioned in connexion with photography. It is one of those minor matters that scarcely seem worth naming.

For those who do not know it, it may be described as a sort of fine and very absorbent felt, waterproofed on one side, and its principal use is for poultices. It is made in various thicknesses, from one-eighth to half-an-inch, how much thicker and thinner I know not, and is sold by most respectable dispensing chemists. Amongst its photographic uses is the draining of plates instead of blotting-paper. Another is to line the table or shelf on which the developing cup and bottles are placed. This quite prevents drops from the outside of the cup from falling on and staining the plate—a misfortune which has, I suppose, befallen most of us some time or other. It is easily rinsed out, and as far as my experience, which is not short, goes, will last almost for a lifetime. Certainly that which lines my plate boxes has been in constant use since the wet collodion days, and shows no signs yet of an intention to give up work.

CHROMATE OF SILVER.

By W. K. Burton (Tokio, Japan).

A copy of The British Journal of Photography which will be very old before this gets into print has just reached me. In it there is an article on halation, which reminds me of many experiments made some years ago with chromate of silver, one of the objects of my experiments being to devise a way of preventing halation. The experiments did not succeed, but I believe that was rather through my own fault or ignorance than through anything else. I believe that chromate of silver is a salt that might be made use of photographically in various ways were it studied with that object by some competent chemist. As I have said, one of my objects was to prevent halation, and this I hoped to do in the manner to be described.

I should say first of all that halation is by no means a simple matter, entirely attributable to reflection from the back of the glass. It has many causes, and the chief of which certainly is reflection from the back of the glass. That it is not the only one is evident by the facts, that we can get halation on paper negatives, and that a halation effect is sometimes visible to the eye. I cannot, however, here go into the whole matter, which I have treated in another place. It is of chromate of silver that I would write.

It appeared to me that halation would certainly be prevented as completely as it could be, by preventing any actinic light from reaching the glass at all, and it further appeared to me that a film of a chromate of silver emulsion would be an excellent medium for preventing the light from reaching the glass. Chromate of silver is of an intense ruby colour. It may be made by mixing a solution of chromate of potassium with one of nitrate of silver, and if gelatine be present—the usual conditions in emulsion making being observed—a beautiful emulsion results. So intense is the colour of the chromate of silver that an emulsion containing the equivalent of only one grain of metallic silver gives a film of a deep ruby colour. The chromate of silver is soluble in hyposulphite of soda (or, more strictly speaking, is decomposed by it, forming a soluble hyposulphite of silver). It therefore appeared that to coat plates with gelatino-bromide emulsion on a substratum of chromate of silver emulsion, would result in a prevention of halation as complete as is possible. I found, however, that failure resulted because the chromate of silver was reduced by the developer, a dense fog being produced. I now see that, with my way of working, this was quite inevitable, but that it is probably not necessarily so. The very evident fact that chromate of silver is sensitive to light did not strike me at the time, and *I prepared my film in daylight!* Of course the developer reduced the exposed chromate of silver. I believe that a developer of the strength commonly used with gelatino-bromide will reduce chromate of silver even when it has not been exposed to light; but this may be got over by leaving the plate, before development, in a weak solution of bromide of potassium till the chromate of silver is converted into bromide. Such treatment will *slow* the after development, but will not prevent as much detail being eventually got as would be obtained without the previous soaking in bromide. It is necessary, however, to observe that the quantity of pyro used must be reduced (or the quantity of ammonia must be increased), otherwise a hard image will result. It is scarcely conceivable that bromide of silver produced by coverting chromate produced in the dark, should be more reducible than bromide produced in the usual manner.

I think it quite possible that chromate of silver may, if a suitable developer be found for it, be discovered to be a very suitable salt for actual sensitive films for negative work. As I have said, it is sensitive to light, and not only so, but a developable image can be produced in it. This was proved by Mr. J. Adams, who some time ago experimenting with chromate of silver at my suggestion, did actually develop images. He got results far from perfect, it is true, but yet such as proved the possibility of developing an image in chromate of silver.

There are certain theoretical reasons for supposing that, could a suitable developer be got, chromate of silver would be found to be far more sensitive than bromide. It is, of course, the fact, that only such light as is *absorbed* by a film can do photographic work. Even it by no means of necessity does such work as it may simply be converted into heat vibrations, but it is quite certain that none which is *not* absorbed can do any photographic work. Now in the case of an ordinary gelatino-bromide film, only a fraction of the light is absorbed. The film is nearly white and reflects a great proportion of the light. It transmits another great proportion, and this generally, in the case of rapid plates, of the

blue or most actively chemical nature. Neither the reflected nor the transmitted light can do any photographic work. Chromate of silver, on the other hand, is red by both transmitted and reflected light, and absorbs *all* the most chemically active light, which *may* all therefore do photographic work. The red colour *ought* also to favour sensitivness to the red end of the spectrum. It would be very interesting to know what the colour sensitiveness of chromate of silver really is. A minor advantage of the red colour were chromate of silver ever used in the camera, would be that the camera itself would be less filled with diffused light—arising from reflection from the plate and re-reflection from the lens and body of the camera—and hence there would be less liability to fog.

A second theoretical reason for supposing it likely that chromate of silver might turn out more sensitive than bromide, is that it is a looser compound. Chromate of silver is readily decomposed by a soluble iodide, chloride, or bromide; iodine, chlorine, or bromine replacing the chromic acid and forming iodide, chloride, or bromide of silver.

I know very well that it by no means follows that salts are sensitive in proportion to the readiness with which they are decomposed—to the readiness, that is, with which the atoms forming the molecules are disassociated one from another. In fact, the greater sensitiveness of gelatino-bromide over gelatino-chloride plates would appear to directly negative the idea. I don't think, however, that it is strictly correct to speak of gelatino-chloride as less sensitive than gelatino-bromide. It is less amenable to development, which is quite a different thing. I don't say that it *follows* that the more readily decomposable a salt is the more sensitive to light it will be. Many of the most readily decomposable salts are not affected by light at all; but other things being equal, the same proportion of light exerting its energy in the direction of decomposing the salt, and there being at hand equally efficient means of absorbing the substance thrown off by decomposition, it is certain that, in one sense, the sensitiveness will be in the same ratio as the decomposibility of the salt. The sense in which I mean this is that the initial change made by the light during exposure will be greater for the more readily decomposable salt. A greater number of molecules will have been broken up into whatever are the forms produced by the action of light, and probably, *could we apply the same developer* to the different salts, the sensitiveness under development would prove proportionate to the decomposibility of the salt. But we cannot do so, for all salts of silver (that I know anything of) are eventually reducible by a developer without the action of light at all, and the more readily decomposed the salt, the more readily is it, as a rule, reducible by a developer. It therefore becomes necessary to use a weaker developer for the salt which is most readily decomposed, and which is presumably most affected by light at the time of the exposure. Take, for example, gelatino-bromide and gelatino-chloride of silver. The latter is the looser combination, and is probably more sensitive than the other, so far as the effect of light during exposure is concerned—the visible effects of a long exposure corroborates this idea—but as it is also more readily reduced by the developer, we cannot apply to it as active a solution as we can to the bromide, and, therefore, as regards the image *that can actually be developed* it is slower.

It is not, however, by any means an absolute rule, that amongst very

similar salts, or even in the case of the same salt in different circumstances, the reducibility by a developer of the salt unacted upon by light varies in the same ratio as the readiness with which the salt is affected by light. Take the two cases of a very slow and a rapid gelatino-bromide emulsion, similar in every way, except that the latter has been boiled or ammonia treated. We can only suppose that small,* light impressions have a much greater decomposing effect on the latter than on the former, that a given amount of light decomposes a greater number of molecules, yet the latter unaffected by light is not much more reducible by a developer so long as we have not pushed rapidity to the extreme.

If my arguments so far are sound, it follows that there is some reason to suppose that, in the case of salts sensitive to light, the intensity of the latent image may be greater, the more readily decomposable is the salt. That it does not follow that the salt is, without the action of light, proportionably reducible by a developer, and that, perhaps, we have only to find the right developer for each of various salts to discover that they are sensitive in the reverse ratio of their stability.

In any case, I feel tolerably certain that it is only a question of discovering a suitable developer, when it will be found that an image can readily be developed on a chromate of silver film, and I am sure that it would be worth the while of a competent chemist to investigate the matter. The writer is not a competent chemist, or indeed a chemist at all, nor has he at present, where he is, at his command the means of carrying out a series of investigations such as those that would be required; but he hopes that his remarks may induce some who have the time, means, and ability to investigate this undoubtedly interesting subject. The investigation might incidentally lead to some elucidation of the vexed subject of the 'latent image.' The remarkable cheapness of a film of chromate of silver is a matter not by any means to be despised. As has already been said, the intensity of the colour is such that quite a dense film is got with an emulsion containing the equivalent of only one grain of metallic silver to each ounce of emulsion.

One or two minor uses for a gelatino-chromate of silver emulsion may be worth mentioning. The intensity of the ruby colour of the film induced the writer some years ago to suggest its use as a dark room medium. It has the drawback that, being sensitive to light, it darkens in bright sunshine, becoming in a few days useless; but it will retain its colour for a very long time in front of an artificial light, and can always be made use of as a temporary expedient where ruby glass or 'stained red' is wanted and cannot be got.

A most ingenious application of the chromate emulsion has been made by Dr. Divers to one of Sir William Thomson's sounding instruments. This instrument consists of a glass tube sealed at its upper and open at its lower. It is sunk in the water when, of course, the amount of compression of the air in the tube is a measure of the pressure of water, and consequently of the depth of the instrument. It is only

* It might be used as an argument by those who contend that the 'latent' or developable image is different in nature from the visible image on photographic films, that whilst we can only suppose that those treatments which increase the sensitiveness of a gelatino-bromide film to be developed, and therefore came, we must suppose, a given very small light impression to do more work, do not increase the intensity of visible images got by long exposure to light, or increase the sensitiveness for contact printing, but rather have the reverse effect.

necessary to have some means of recording the extent to which the air has been compressed, when we have a record of the depth to which the instrument has reached quite independently of the perpendicularity, or otherwise, of the cord whereby it has been sunk. Consequently the instrument may be used whilst the ship is in rapid motion.

Chromate of silver is converted by any soluble iodide, bromide, and chloride, amongst others, common salt, into a halogen salt. In other words, any of these soluble salts (say, common salt) changes the brilliant red of the chromate into white. Practically bleaches it. It was therefore only necessary to line the inside of the glass tubes of Sir William Thomson's instrument with a film of chromate of silver to get a means of recording the exact extent to which the air in the tube had been compressed, and to which the water had risen, the salt of the water as it rose bleaching the chromate of silver.

It remained for Dr. Divers to recommend the exceedingly practicable form of film now used, namely, a gelatino-chromate of silver emulsion.

GREEN FOG *REDIVIVUS.*

By Marston Moore.

A few years back workers of gelatine plates were sorely perplexed by the appearance of several forms of coloured—chiefly green—fog upon their negatives. Various theories accounting for the disagreeable phenomenon were broached and several remedies advocated, but the former were never satisfactorily substantiated, and none of the latter were found to possess a tithe of the power claimed for them. To the contention that the malady was due directly to the action of development, the mass of evidence did not appear to point; rather it seemed to be the effect of causes for which the operator was in no way responsible. Indeed, it is probably not unsafe to affirm that the only feasible conclusion to be arrived at after a careful consideration of the published experiences of many able workers, was that green fog was a physical defect of certain emulsions, and that its origin was to be ascribed to the formulæ and methods of the manufacturers. Of course this remark refers only to the involuntary appearance of the unwelcome visitor on the film under normal conditions of exposure and development, for it has been established over and over again that although a given plate may not possess an inherent tendency to the green or parti-coloured fog disease, yet it is quite possible to call it into existence by (1), under exposure and forced, or over development, or, (2), by the prolonged development of a correctly exposed plate. In fact, fog, coloured, local, or general, is as easy to produce as ordinary density, and with many of us, I fear, easier.

Fortunately the disease was either stamped out or died a natural death after a time, possibly owing to the introduction of suitable modifications in the manufacturers' formulæ. By some it was not thought that the experimentalists, in their attempts to solve the mystery, were on the right track. That opinion was undoubtedly based upon good grounds. Coloured fog in a collodion film was, I believe, unknown; it put in an appearance for the first time in its more treacherous successor. Hence possibly it might have been more profitable, and there would have been greater likelihood of getting to the root of the matter, if some inquiring worker

had experimented with several emulsions that were alike in every respect save in the variety of gelatine employed, for therein, doubtless, the true cause and explanation of the defect was hidden. The characteristics of some gelatines that are supposed to be absolutely identical are very dissimilar, and the results they yield positively surprising. Formerly the soft varieties were generally used, but latterly the tendency has been to substitute for them a particular variety described as hard. In consequence, we hear less of frilling troubles than formerly, but, *per contra*, the gingerbread is deprived of its gilt by the appearance of a plague of iridescent markings and coloured fog, of which many complain. Whether this is merely a coincidence or whether it is due to the indicated alteration in manufacturers' methods, it is not the present object to inquire. We shall, doubtless, have an authoritative theory expounded in due course. I propose on this occasion to relate some recent experiences with this iridescence-*cum*-coloured fog pest in the hope that their narration will be of service in drawing renewed attention to a defect which, like the poor, is always with us. I shall not offer a certain cure; there does not seem to be one in existence. Nor is there any violent necessity for one when we have at hand that which is far more valuable, viz., the power of prevention.

Recently there came into my possession two or three dozen plates which were believed to be liable to iridescent markings. They registered three degrees below the maximum of the sensitometer usually employed to approximate emulsion sensitiveness, and were perhaps nine months old, which is a good age, despite the strange craving amateurs and professionals alike have for 'freshly' made plates. I may premise that it was my design to employ these particular plates in quite the usual manner, that is to say, I timed their exposure, and chose the strength and constituents of my developer just as if they had had the reputation of being faultless in every respect. My first plate was exposed, and, as it proved, fully so, upon an outdoor subject. I used the now favourite carbonate of soda in the developer. The negative had plenty of density, and the image was full of detail, but, sure enough, round the edges, to the depth of about a third of an inch, was an unmistakable belt of iridescence. The plate had been exposed right up to the extreme edges, and the rabbet of the slide did not cut off the smallest bit, and for the reason that I used carriers in a large camera and the plate rested at its four corners upon the old-fashioned pieces of wire. Then I took a couple of negatives of a friend's house with precisely the same result: iridescence round the edges. Next I exposed about a dozen plates indoors, portraits and groups being the subjects, using, by the way, a single achromatic Grubb of the old type with a fixed diaphragm. My exposures erred, I imagine, on the side of fulness, varying from eight to fourteen seconds on an August afternoon.

The range of results was extensive and certainly peculiar. In the fully-exposed plates the iridescence was still confined to the edges, but as it became apparent that some of my exposures had been too brief, so in exact ratio with the under exposure did the iridescence extend, and become, as it were, merged into a dense green fog, until in those at the bottom of the scale the markings covered about five-eighths of the entire area of the plates, and, viewed by reflected light, appeared like miniature rainbows edged with opalescence, and by transmitted rays veiled red,

dusky brown, and even purple. The opinion I arrived at was that these general stains are caused by serious under exposure in combination with the lack of covering power of the lens, and my method of confirming that opinion was by making a transparency on the half of one of the plates and blocking up the other half with four thicknesses of aurine paper, the result being a positive relatively free from the markings, whilst that part of the plate which should have been clear glass was considerably more stained and veiled. Incidentally I lighted upon a favourable characteristic of the carbonate of soda in the developer. Two of the plates which had had precisely the same length of exposure within two minutes of each other upon the same subject in a bright light were developed, the one with ammonia, the other with soda, both developers of normal strength, and the plate developed with the latter was marked and stained infinitely less than that which had been treated with the former.

The irresistible deduction seems to be that while some batches of plates may be, and probably are, prone to iridescence and the various descriptions of coloured fog, it is not indubitable that such phenomena must appear on the surface of the film save at the extreme edges, which are in all cases notoriously the weakest part of the plate, if full exposure be given and normal development followed.

PRACTICAL HINTS ON THE SUCCESSFUL WORKING OF EASTMAN'S AMERICAN STRIPPING FILMS.

By John Jackson.

The worthy Editor having requested an article for his Annual, I with much pleasure give my experience to the readers thereof in the successful working of the stripping films which have been introduced by the Eastman Film Company, and in doing so I may state that I have been daily working these for a period of twelve months, in which time I have had an opportunity of gaining much experience and many useful and important suggestions regarding the manipulation and production of negatives on these films, and if in this article I, by recording these, may tend to lighten the labour of others who are working the same, I will be amply repaid for these notes.

I do not mean to describe the nature of these films, as I think this has been fully explained before in the journals and periodicals during the past year. I shall therefore proceed to give in the first place a few hints as to the working of the roll holder.

The first thing that the tyro should do is to practice the working of the roll holder, and become acquainted with the mechanical arrangements of this instrument in daylight, and go over the various necessary movements several times, using a dummy spool, and after he has mastered this, and is confident of its working, he may then proceed to put in the sensitive spool in the dark room. Having successfully accomplished this operation he ought to take a pencil and draw a line across the face of the film at each extremity of the first exposure. This is a good guide for starting when cutting off the exposures. Of course to do this the shutter must be withdrawn. Examine carefully the roll holder and camera to ascertain that everything is light-tight, and also be careful to note that the winding apparatus, indicator, and clicks, &c., are all in working order.

Next comes exposure and the systematic winding off the successive films. There are two modes of doing this, and it lies with the operator himself which method he may adopt. In my practice I find it best, immediately after having made an exposure and replaced the shutter, to wind on a fresh surface, ready for the next picture that may have to be taken. Others prefer to delay winding until another exposure is going to be made; but my objection, and I deem it a fatal one, to this method, is that you may be all ready for your exposure, having wound on the film, and at the last moment, after this is done, something may occur to prevent the exposure being made, thus at once upsetting the working of this system. By always winding immediately after an exposure mistakes cannot occur.

With regard to exposure of the film, this must be left to the judgment and experience of the operator; suffice it to say here that these films allow of great latitude, and yet are quite sensitive enough for instantaneous exposures on fairly lighted subjects.

Development.—With regard to the light to be used in the developing room, I cannot do better than refer my readers to an article on this subject in last year's ALMANAC by Mr. A. Pringle, page 84. I have found that 'darkness made visible' is the most appropriate term to use for the source of illumination used by many operators. Good work cannot be made where you cannot see properly what you are doing, and in the development of films it is absolutely necessary to get all the light possible in order to the proper density being obtained. The light I use is a single gas jet placed behind a screen of canary medium. This gives a light sufficient to see by all over the operating room, and yet is quite safe, and will not fog the most sensitive films or plates. The formula which I have found best suited for the films is the following:—

No. 1.

Sulphite of soda	6 ounces.
Dissolve in hot water	32 ,,

Allow this to cool, and acidify with citric acid, adding the acid gradually until by testing, litmus (blue) is red. Then add pyrogallic acid 1 ounce.

No. 2.

Carbonate of soda (pure)	3 ounces.
Carbonate of potass	1 ounce.
Water	32 ounces.

No. 3.

Bromide of potassium	1 ounce.
Water to make	10 ounces.

To develop, take equal parts of Nos. 1 and 2, and from two to four parts of water, according to the nature of the subject and kind of negative required. As a rule it is not necessary to use any bromide, but it is well to have it at hand in case of great over exposure, so that a few drops may be added, if necessary. Before beginning to develop the film should be soaked in plain water for a few minutes, then placed on a clean developing dish face up, and a soft camel-hair brush passed gently over its surface. This not only removes any air bells that may be on the surface, but also lays the film flat on the dish, which is a thing to be desired in

order to produce equality in development. As a rule I like the image to begin to appear in about from thirty seconds to one minute, and to finish in about two to three minutes, and when finished the whole image should be in appearance almost lost by reflected light. Allowance must be made when looking through the film for the semi-opacity of the temporary paper support, so that development must be carried apparently farther than with a glass negative. I find it a good plan to weaken the developer with water towards the end of development, and allow the films to soak in this for some time. This gives density without hardness. Now wash the developed films for a short time in water, and then fix in clean hypo solution, the strength of which may be eight ounces to thirty-two ounces of water, and in order to prevent staining of the films it is very important to note that they should be thoroughly immersed in the hypo and kept moving about during the process of fixing, carefully noting that no parts of the paper are above the liquid. Should such occur stains from sulphuration will surely arise which cannot afterwards be cleared away.

Troubles sometimes arise through imperfect fixing. When the paper is stripped off the appearance of light yellow (but which in the light of the dark room seem white) patches are from this cause, and the remedy is to plunge the stripped film, still on its glass support, into the hypo bath, when they will soon disappear, and well wash before proceeding farther.

After fixing the films are to be washed for a short period, say from ten minutes to fifteen minutes, and they are then ready for

Stripping.—In order to do this take a clean glass plate and coat this with indiarubber solution, which is poured on in the same manner as collodion, the excess being allowed to drain off at one corner. This is now allowed to dry, which will take about a minute. A number corresponding to the number of negatives to be stripped may be done and set in a rack to dry, and kept free from dust. The strength of the solution should not be over one grain of pure rubber to the ounce of rectified benzine.

Let me here draw particular attention to the fact that a great many failures arise through using too strong a rubber solution, such as the corners of the film frilling when stripping, or adherence to the glass, especially in summer, on account of excess of rubber or that of an inferior kind. Only the purest gum and best rectified benzine, and prepared according to the formula of the Company, should be used, as I know that many preparations are made and sold which are perfectly useless for the purpose. Should any one be unable to obtain such through a dealer he can have it on application direct to the Eastman Company.

The plates are now coated with collodion varnish, and as soon as the collodion *sets* they are immersed in water and allowed to remain there, washing until all the solvents are thoroughly washed out, which will be ascertained by the disappearance of the greasiness on the surface of the plate. The negative film is then placed in contact with the collodionised plate in a dish of water, the whole lifted out and squeegeed well down, placing a piece of blotting paper and rubber cloth on the top of it, then place under pressure between sheets of *dry* blotting paper for at least twenty minutes, and then put in water, the temperature of which may be from 100° to 130° Fahr. If all the previous conditions have been properly executed the paper will now in a very few minutes begin to blister, and will presently float off, leaving the negative on the collodionised glass.

Now there may be some of the soluble gelatine left on the stripped negative, and it being necessary to remove this, a soft, flat, camel-hair brush should be passed gently over the surface of the negative while still under water. When this is done plunge the negative into cold water and wash for a short time. Should intensification or reduction of the negative be necessary now is the time to do it, and this can be done by any of the methods used for the intensification of glass negatives, or if the negative is required for mechanical printing, or where a reversed negative is required, it may be dried, and, if necessary, varnished.

If it has to be taken from the glass and used for ordinary printing, the skin or support must now be put on to it. To do this, place the negative which is still adhering to the glass into a dish of water to which has been added a small quantity of glycerine, say one to twenty, and place the skin on the top of this and allow it to become limp, and then withdraw the glass plate from the liquid with the skin floating on it. Then squeegee down gently with a soft squeegee *without* the interposition of the rubber cloth, and set aside till thoroughly dry. Now coat with collodion, which acts as a protection from damp. When the collodion is quite dry, which will be in about fifteen minutes, take a knife and cut round the edges of the finished negative, and, lifting up one corner, lift it gently from the temporary glass support. And I may here give a word of caution: do not allow the face which has come off the glass to come into contact either with itself or the face of another negative for some time, as there appears to be a sort of electrical action caused by the withdrawing of it from the glass which takes some time to disperse, and through which they stick tenaciously to each other if they should meet. Place them between the leaves of a book, which keeps them flat.

Now, to conclude, just a word regarding the skins. There are two kinds of those issued by the Company, and they require slightly different manipulation. First, the matt surface skins. These get limp immediately, and the bath I recommend for them is the following, viz.:—

Water	15 ounces.
Glycerine	2 ,,
Methylated spirit	5 ,,

Second, the clear skins. These require a little longer soaking, and omit the methylated spirit in the soaking bath.

ON VIEW MEASURING.

By J. A. C. Branfill.

Although I seldom see a view-meter used by others, I find it a great help. Some years ago I purchased one, but finding the eye-hole too small I enlarged it to about a quarter of an inch diameter, and even then I could not see the whole field of view, except at a small angle; I therefore removed the flap containing the eye-hole and use the meter by holding the horizontal bar against the cheek-bone, and now find it a most useful instrument.

A short time ago I learned from a justly celebrated amateur photographer the system of judging the angle of view by estimating how many spans it occupied when the arm is extended as far, and the hand as wide as possible; this I find a very valuable method. But I prefer my

view-meter, as it frames the view and shuts out extraneous objects. Being desirous of knowing the angle subtended by my own span, I determined it by counting how many spans it took to include 360°, and found the number to be nineteen, which gives an angle of 19° per span. This knowledge enables me to reckon roughly how soon the sun will be in a certain position, assuming (till I know more correctly) that its apparent motion is 15° per hour; and, doubtless, I shall find many other uses when outdoor work commences again.

A TRANSPARENCY.

By J. Hide.

I sit and watch the fire with moody stare;
Fiercely I stir it, as if with its glare
I would commune.
Dark, gloomy thoughts are in my spirit rife,
Soured and sore with the old-world strife,
The falseness, unreality of life—
I'm out of tune.

I hear the rippling laughter of my child,
Her sunny presence bounds in glad and wild—
Two bright blue eyes.
Nature's fresh picture, as from Eden's clime,
Now makes my heart-bells ring with joyous chime—
New harmonies!

Oh, sweet transparency of heart and love,
Pure as the snow that eddies from above,
For innocence and truth—blest, heaven-sent dove!
This old earth sighs.

REGISTERING PRINTS.

By Lyonel Clark, C.E.

Nothing new to many of you, no doubt, but still there may be some of our amateur brethren less fortunately situated, to whom the hint may be useful. The size of the ordinary cabinet negative is $8\frac{1}{2} \times 4\frac{3}{4}$, whereas the cabinet size of cut paper is only a little over 5×4, the extra size of the negative being, of course, to allow of a little latitude in placing the sitter. When the print is placed on the negative we have then to adjust it to get in exactly in the right position. This is generally done by holding the negative up to the light and looking through it, shifting the paper to and fro meanwhile till the best effect is secured. Now in the ordinary way this has to be repeated every time a print is taken, and it is very seldom that the same position is exactly obtained. Now the way I proceed is as follows:—I hold a cabinet glass cutting shape in front of the negative and shift it about till I have obtained the best position; I then make a good thick pencil mark all round the shape, and have at once a guide showing exactly where to place my sensitised paper each time to ensure perfect similarity in all my prints. For those who use

half-plate paper this is, of course, unnecessary, but the advantage of using cut paper is very great. You don't have to wait till your print is dry and then trim it; you can keep the prints under pressure and moist till they are required and then mount them direct. The simplicity of this little dodge is only equalled by its utility.

SOME CAUSES OF FAILURE.

By Rev. J. Carter Browne, D.D.

It would be interesting to know the percentage of failures that fall to the lot of the ordinary amateur. Being one of the longest-standing hands in these parts, it is no uncommon thing for me to be called upon to diagnose the condition of several negative patients per week. 'Can you tell me what is the matter with this?' is the usual cry. It is an undoubted case of fever of some kind. The whole negative is covered with spots varying from the tiniest pinholes to others of quite a sixteenth or even more in diameter. They are transparent, and always circular. Even a quarter inch power on the microscope fails to discover a nucleus in the shape of dust, as in the old collodion days. My own family has not been free from the disease. I have used plates by no end of makers, and all but one or two are infected. I have, however, succeeded in reducing these spots to a minimum. Of course, I dust my plate before placing it in the slide. On emerging I place it in a dish, and, immediately after pouring on the developer, with a broad camel-hair brush I draw it gently all over the plate, lengthwise and crosswise, for half a minute. By this means I get rid of all small air bubbles, and thus I seldom have transparent spots. Lines caused by the brush will show somewhat alarmingly as the negative is drying, but they entirely disappear in the end.

Another cause of failure with amateurs is owing to no notice being taken of the time of day when the plate was exposed, the result being either a fearfully over-exposed and, therefore, monochromatic-looking patient, or one so hardly developed as almost to remind one of the old chalk and sticking-plaster tribe.

Again, how many poor, thin, underfed patients come to me! Nearly all my 'patrons' fall into the fatal mistake of not developing far enough. They become afraid when the superficial details begin to disappear, and into the fixing bath they hurry their plate, seldom to be left there longer than just to get rid visually of the unconverted silver. For my own part I develop until I am almost frightened at the density; and if ever I find I have given an over dose—an eventuality by no means uncommon—alum, citric acid, and protosulphate of iron, judiciously administered, gives, as result, a fine, vigorous, plucky negative.

Another prolific cause of failure is due to the use of cheap lenses. I invariably find that the poor-looking negatives that my friends bring me are taken with nameless lenses. This is a difficulty less easily overcome, as when once a beginner has bought his apparatus he is little inclined to change it for a more expensive one. My method in this case is to take a picture side by side with them and allow them to see the proof positive. I am not condemning all nameless lenses, but by far the greater number. The after trouble of crystallisation and humidity on

the negative is too obviously due to want of proper washing to need comment. By way of parenthesis, I may remark that I have long discarded the somewhat perplexing formulæ for development, each differing with the various brands of plates, and I now use nothing but Edwards's, modified in a few simple particulars. I find that nearly every brand of plate will yield a good negative with this developer and its modifications.

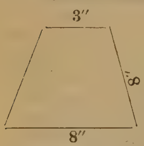
I should like to have gone further and spoken of failures in subsequent operations, but I fear I have exhausted now too much space, and must, therefore, leave further remarks to another occasion.

PHOTOGRAPHIC LAMP SHADES.

By H. J. Rabbeth.

I think that the following method of making really very effective lamp shades may be new to some of your readers, as I have not seen it adopted by any one but myself.

I take a sheet of ferro-prussiate paper and cut it up into pieces of this shape; of course the size is immaterial and may be altered according to dimensions of lamp for which shade is required. I then place the paper under a negative (quarter-plate) in the printing frame; if this is done carefully the paper need not be creased much, and the subsequent washing will remove what creases are made.



When printed pretty deep I remove paper and, placing some circular object, say a jam-pot, over the centre, leave it exposed to the light until the uncovered portion of the picture is effaced; I then fix the print by washing in the usual way, and having joined the necessary number of pieces, say, six, together by gumming them to strips of tape, the shade is complete.

CENTRIFUGAL SEPARATION IN EMULSION WORK.

By Andrew Pringle.

When the theory of centrifugal action as applied to gelatine emulsions first came under my notice, I must confess that any opinion I formed was not in favour of the process. It may have been that the matter was not put to me in a proper light, it may have been due to my inherent stupidity, or it may have been that the grapes were *scarcely ripe*, but the fact remains, I did not jump to 'separation' at first. I have found cause to alter my views, and I now believe that centrifugal separation is a process of great value in the manufacture of gelatine emulsions, and I will give my reasons for the faith that is within me.

First, let us take some facts. Emulsions nowadays are brought to a state of high sensitiveness either by boiling, or by the action, more or less prolonged, of strong alkali on—something; whether that something is the gelatine or the haloid salt is immaterial to my present argument. The fact in each case—in the boiling process and in the ammonio-nitrate process—is that the gelatine itself is strongly acted upon and more or less decomposed. It is also a fact—almost universally admitted, as I believe—that a combination takes place between the silver and the gela-

tine, and that to this combination are due certain kinds of fog. Anyhow, I have had foggy emulsions, and by removing the gelatine I have removed the fog; that is a pretty fair and a pretty strong argument. I have effected this simultaneous removal of fog and gelatine not only by centrifugal separation but by other methods, as by precipitation, and by destroying the viscosity of the gelatine by acids so that the silver salts subsided. But the precipitation method is abominably uncertain—has been so in my hands, at least—and the use of acids, notably acetic, affects injuriously the general character of the emulsion. I think I may safely argue that a sure and simple method of getting rid of decomposed gelatine is a *desideratum*.

Now comes the question: To what extent does the separator relieve us of the decomposed gelatine? I have only myself used a small-sized centrifugal separator, the four and a half inch basket of Messrs. Watson & Laidlaw, but I have used it carefully, and my belief is that we get rid of *all* the decomposed gelatine. I admit that a certain amount of gelatine is left behind, binding the grains of Ag Br, &c., to the sides of the basket, but I don't believe that small quantity of gelatine is the decomposed gelatine. If we cook our emulsion to a *very* great extent, if we get our Ag Br to a *very* coarse state of division, we find after separation that the Ag Br sticks like grim death to the basket sides; simply because, I argue, all, or nearly all, our gelatine is decomposed, has lost viscidity, and is not binding our particles of Ag Br to the sides, partly also, I admit, because the 'grains' of Ag Br being larger, the centrifugal force acts on them more vigorously. But a slow emulsion, when separated, is found loosely adhering to the sides in a gummy sort of mass, indicating plainly the presence of a larger quantity of viscous gelatine, pointing to the fact that as the ripening, or cooking, or digesting action has been milder, less of the gelatine is decomposed. May I then not state roundly that the separator removes decomposed gelatine, and with it certain kinds of fog? and may I not claim in this for separation an advantage over washing processes, for we all know that no amount of washing will ever remove the kind of fog to which I allude?

Next, as to removing the by-products of decomposition. I do not know why it should be so difficult as it is to remove nitrates from gelatine 'jelly' by simple aqueous washing; but I know that it is difficult, and I believe that the operation is very rarely thoroughly performed. There is a certain repelling action in gelatine which no doubt accounts for much of the trouble, for the nitrates themselves are soluble enough if the water only gets at them. When precipitation by alcohol is resorted to, we have a mass still more repellent of water, no matter how minutely we divide it short of actually making mince collops of it. We used to find with this process that not less than twenty-four hours of washing in running water sufficed to remove all the soluble salts; sometimes we could even detect them after more than twenty-four hours. Well, I can get rid of the nitrates perfectly with a separator in about three minutes, or five minutes at the outside, counting the time taken to rinse out the basket, as I do once with cold water.

How much silver goes down the sink during an ordinary washing of emulsion in water? How much do we lose in the separation method? I dare not attempt to answer the first question, but I will try to throw some light on the second. I had separated a batch of emulsion con-

taining precisely 125 grains of Ag Br, I poured into one beaker the liquid left after separation, I rinsed very gently the basket with an ounce or two of fresh water, and put that water into a second beaker. (It was a very rapid emulsion, giving me later a fine 25° on Warnerke's sensitometer.) I allowed the two beakers to repose two days; the first one showed no visible precipitate at all, the second showed a slight precipitate, which on drying and weighing I found to be under one grain! The nitrates must all have been in the first beaker, for the small quantity of precipitate I saw in the second was evidently silver salt scoured off the basket by my rinse. Had the emulsion been less cooked—or less coarse in the silver grain—I could not of course have done this.

When we have performed the operation of washing with water in the ordinary way, whether after precipitation, or squeezing, or breaking up in any other way, how nearly can we say how much water the gelatine has taken up, how much silver the sink has taken *down*—in fact, what amounts of gelatine and haloids we have? I fancy 'x' would, as a rule, represent these quantities. In our basket after separation we have a quantity of silver salts known to within a grain or two, and discoverable to a grain by analysis of the rejected liquids if we are very particular. We have nothing to do but to take a definite quantity of gelatine, a definite quantity of water, a definite quantity of anything else we like, and mix these up with the contents of our basket, and we have an emulsion of which we know the constituents exactly. I confess I do not know how we can say as much for any washing process.

At first when I did not like, because I did not understand, the centrifugal separator, I used to say, 'At any rate it is a rattling good thing for residues.' I have not changed my opinion on that point, except that I withdraw the word 'rattling.' It is important not to allow a separator to rattle, for if it does it is being more or less damaged, strained, and unbalanced.

Some persons have tried the centrifugal separator and failed. Nothing wonderful about that. When first Paganini tried to play the violin he failed; had he stopped then he would never have become a good fiddler. My first attempt with the separator was a great success; my second and many following attempts were utter failures—I got my emulsion thin and slow. But at last I got it right, and so will others who 'try, try, try again.' (Quotation I believe from a book of my youth which has stuck to my head better than some things.)

It is not a happy Christmas wish, 'May we separate;' I shall amend it with: Let us join to separate.

WASTE PLATES—WET PLATES.

By William Adcock.

Spoiled plates are inevitable, even with the best regulated amateurs. A professional knows what to do with them, but some amateurs may possibly be glad of a hint.

Many courses are open—as glaze them up, or sell them to your plate maker, or coat them with emulsion, or get them coated, or after well washing in potass water use them as collodion wet plates. In my opinion the last is best. There is to the intelligent photographer a great

charm in the old process. It taxes intelligence to keep the bath in order; it demands neat manipulation (soon acquired); it gives beautiful results; it is not costly. Even to those possessing a studio I recommend a nook in the back yard or garden for exposure and figure as a subject. The open light will make up for slowness of action, and thus no unreasonable demand upon the steadiness of the model will be made.

To those wedded to landscape the preservatives are available—as coffee, beer, syrups, &c.

It may be desirable to say that the dual process of dry and wet plate must not occur in the dark room if ammonia be used in development.

ENLARGEMENTS ON CANVAS.

By Hermann Schnauss.

There are published different processes for the production of enlargements on canvas, but the simplest and best one I know consists in making an enlargement on a collodionised glass plate from the small negative and in transferring it to the canvas.

The transparency, after being developed and toned, is placed into a dish containing a solution of

Citric acid	1 drachm.
Water	35 ounces.

In this solution the collodion film loosens at the glass plate. Now, pour off the acid solution, rinse under the tap, place the plate on the table, and cover it with a sheet of fine blotting-paper. The paper, however, should be somewhat smaller in size than the collodion film, so that you may turn up the edges of the film.

The surface of the canvas is rubbed with warm soap-water, well rinsed, and then rubbed off with methylated spirit with the aid of a sponge. Finally, a solution of

Gelatine	16 grains,
Water	5 ounces,

is applied to the canvas with a camel-hair brush, and allowed to dry.

Now, the blotting-paper, in a wet state, is stripped off the glass together with the film and placed on the canvas, so that the film will come into contact with it. Then the blotting-paper may be stripped off.

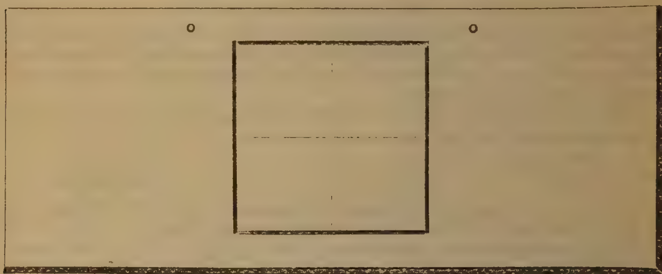
INCIDENTAL EXPERIENCES.

By W. Ingles Rogers.

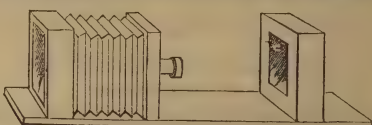
In accordance with the Editor's request, I have collected together a few of my photographic experiences which I think may be of service to some of my brother photographers, be they amateur or professional, believing that by so doing I shall be adding a few drops to the stream of progress, as it is to these experiences that we owe in a great measure the improvement and progress of an interesting science.

In the first place then, as stereoscopic photography seems about to be revived, I would venture a remark on that subject. Has ever any of my *confrères* tried the experiment of superimposing two stereoscopically-

taken pictures one on the other after the manner of the composite process, and then viewing the result through the graphoscope? If not, I advise them to do so, they will be pleasantly surprised. There are two modes of effecting this. One is to 'take' and print the views precisely as if intended for a stereoscopic slide. When printed, toned, and fixed, they are mounted on plain pieces of millboard, merely to keep them stiff and flat during the process of superimposition. As there are some, perhaps, who are unacquainted with this superimposing business, it may be well to state the manner in which I go about it. First of all I cut out a square aperture in a piece of cardboard, and across this aperture fasten two threads so as to cross each other in the centre. On each side of the aperture I prick a hole with a pin, about as far apart as the width of the prints. This I call my gauge, and a representation of it is given below—



I now lay this gauge upon one of the prints, making the threads correspond with certain lines in the picture. Then with a pin I prick through the holes in the gauge, and also through the mount. The other print I treat in the same manner, taking care, however, that the threads correspond with the *same* lines. Through the bottom of a square box I now thrust two pins with their points projecting outwards and the same distance apart as the holes in the gauge. Then, standing the box on its side on a table, I hang one of the prints on these pins by the holes already pricked in it and adjust my camera. The arrangement may be more readily comprehended by the accompanying diagram.



Considering the exposure required for copying a single print which, for instance, we will say would be eighty seconds, I expose my plate on this print for forty seconds, cap the lens, remove the print, replace it by the other, and expose another forty seconds. When the plate is developed the pictures are found to be very accurately superimposed. The alternative method is to superimpose the pictures direct in the camera from the original, but as this is a matter of extreme difficulty, I shall not go

into the details of it, as I think the former plan will be preferred, even though it is a rather more roundabout one.

I have now to record a curious instance of *Water as a Restrainer.* Some weeks ago I photographed a social group and was, of course, very anxious to make it a success. What was my dismay, however, to find on applying the developer that the plate was considerably over exposed. With an impatient impulse I took it out of the bath and put it into a dish of clean water which I always keep handy for possible use, while I hastily racked my brains for some method of rendering the negative at least 'passable,' but to no avail. Turning to the ill-fated plate I lifted it out, and was surprised to see that development had proceeded and was still proceeding, though at a very slow rate. I returned it to the dish and something prompted me to add a few drops of pyro. Taking about a drachm of my ten per cent. pyro solution, I mixed it with the water and gave the dish a gentle rocking. At this the development was greatly accelerated, details came out splendidly under the circumstances, and the whole plate presented a very healthy appearance. Continuing this action for about five minutes, I drained and fixed the negative, and on looking at it by white light was astonished to find that scarcely a trace of fog was visible, though had I continued to develop in the usual way the plate would evidently have been useless. Now I do not intend to give a theoretical explanation of this; in fact, I am unable to do so, but the fact remains, and its veracity is open to the investigation of any one who will adopt the same plan when in a similar strait. I may say that I am unacquainted with the exact quantity of water in the dish, but it was probably about half a pint, and the plate in question was a half one (Ilford).

A word now about drying negatives. I noticed a remark a month or two ago in THE BRITISH JOURNAL OF PHOTOGRAPHY on this subject. It was in the article 'Continental Photography,' and was to the effect that a negative becomes more dense by being dried near a fire. This fact is confirmed by my own experience, indeed I go further. It is my usual custom when developing in the daytime when the sky is clear, after thoroughly washing the negative, to place it in a drying rack till surface moisture is removed and the film begins to harden, then to put it on a horizontal surface (the printing table, for instance) exposed to the full rays of a burning sun. Again and again have I done this, and may truly say that the density *was* considerably increased, and, in the case of a weak negative, to such an extent as to dispense with the otherwise necessary intensification. It may be, however, that *all* plates will not bear this treatment, but with the ones I use (the Ilford) I have never known one to come to grief.

To touch upon another subject, the difficulty of photographing young children is too well known. Many and varied are the devices resorted to for the purpose of catching the little one's attention at the right moment. Those, however, who possess a musical-box (and who does not?) have in their possession a ready and certain means of overcoming this difficulty. Having wound up the instrument, place it behind you out of sight, if possible, but conveniently near the camera. All being ready for exposure, touch it off. The effect is marvellous! The little creature at once pricks up its ears, assumes a radiant expression, and becomes transfixed with joy at the strains of 'Come into the garden, Maud,' or 'Auld Lang

Syne.' While thus entranced it is a simple matter for you to fire your shutter.

But it's time I took a retrospect of what I have written. Ah! I must draw in my horns and retire into my shell, or I shall be abusing the Editor's forbearance. Before I conclude, however, I must relate a little incident that occurred a short time since, and which like the rest of my experiences has its moral. Having occasion to photograph an interior, I collected together my paraphernalia and proceeded to the spot. Adjusting and focussing duly accomplished, I inserted the slide, removed the cap, and ensconced myself in a corner with a newspaper for an hour and a quarter, this being the time I considered necessary for the correct exposure of the plate. The time having expired I gathered up my traps and made tracks for home and the developing room. But what was my astonishment on developing to find that the plate had not received a single impression; it was, in fact—to use a rather questionable simile—completely bald! What could be the reason? The shutter of the slide had been raised and the cap removed, as I remembered I was extremely precautious about this. What then could be the cause? I carefully reconsidered all my previous operations. I had placed one plate in the slide facing No. 1 shutter and backed it with two pieces of black cardboard. Ah, now it flashed upon me! I had inserted the slide with No. 2 shutter facing the lens, and had exposed the cardboard.

Moral.—Either load your slide with *two* plates, or note carefully before leaving home the particular shutter against which your *one* plate is placed. And now, having fulfilled my intention of relating a few of my casual experiences (though the stock is by no means exhausted) I must crave your pardon for having occupied your attention so long, and refer you to the next article.

ARCHITECTURAL PHOTOGRAPHY.

By Richard Keene.

The study of architecture has a fascination for many to whom the brighter beauties of an open landscape have less charm, and it is fortunate that such can easily gratify their taste to their heart's desire, for our country is thickly studded over with monumental records of past ages in its castles, churches, and mansions; nor must we omit many buildings of humbler growth, from the picturesque half-timbered dwelling to the lowly cottage. Each and all of these, before they pass away, may now be faithfully represented in our portfolios in a permanent fashion. Our topographical or historical books may also be interleaved, and made doubly useful and interesting by the insertion of platinotype prints made with a suitable margin by masking the negative. A good print done by this process, when it has a white margin, very much resembles a mezzotint engraving, and is eminently suited to book illustration. Next to landscape work, perhaps, no branch of our art is calculated to give more pleasure to its votary than architectural photography; indeed, the results are far more satisfactory than can always be got in landscape work, and more real expression of the subject is attainable. How inimitably it renders the glorious carving of our Gothic edifices, and saves from oblivion the precious details of mouldering stones, whose texture even is given with marvellous truth. There can be no doubt that photography is pre-

eminently adapted for architectural work, and is to the archæological student a most valuable and trustworthy aid.

Amid the great army of amateurs there will be some to whom this branch will be of greatest interest, and to whom a few hints may not prove useless, though I may have nothing new to propose. In the first place, good rectilinear lenses of various focal lengths are indispensable; so also is a good camera with swing back and rising front. A tripod, whose legs may be shortened at discretion, is extremely useful, especially when clambering among seats in some old church, and the legs are not wanted all of the same length.

Interior work can be done best with plenty of exposure on a dull day, or, rather, when the sun does not shine in brilliant patches on the walls and floor; for however one may admire these 'Jacob's ladders' and the dancing motes ascending and descending, they are beyond the reach of the camera to represent truly, and will probably spoil your picture. In developing use but little pyro, and have your developer well watered down.

As in taking the view, so in developing it—don't be in a hurry. A level may be found useful in setting your camera horizontal, though I have never used one, for I generally find some window, pillar, or other upright which may be kept parallel with the side of the focussing screen so as to ensure freedom from distortion. However, levels are now made well and cheaply, and only add an ounce to the weight of your camera when screwed on. Focussing dark interiors is sometimes difficult; so, besides a magnifying glass, be provided with some wax matches, or a taper on which to focus the middle distance. They will also be found useful to show what is included in your view, for not always can you see it on the focussing screen.

There are no difficulties in outdoor architectural work. The great point is to take your views at the proper time when the sun is shining, *i.e.*, when shadows are cast in the right direction, so as to give relief and solidity to the object. Nothing looks so flat and tame as a building evenly lighted all over. Thus, if you want an effective view of a village church (properly *orientated*, as all old churches are) from the south-east, you need not trouble to get to it before noon, for the sun will shine on both east and south sides till then.

In conclusion, let me persuade all photographers, especially lovers of old buildings, to let no opportunity slip of securing records of such in their immediate neighbourhood, ere they are altered, restored, or altogether destroyed.

RENOVATION AND REDEVELOPMENT OF GELATINE NEGATIVES.

By W. Harding Warner.

Looking over negatives taken years ago and varnished, I was grieved to find that many of them were covered with round transparent spots of the size of a threepenny-piece for the largest, and a good-sized pin's-head for the smallest. They were specially noticeable on plates taken in 1882 and 1883; they resembled a violent case of pitting similar to

small-pox. The negatives were useless, and I feared irremediably so. However, we determined to try and renovate them.

They were first put into a bath of methylated spirit that had been used many times before, and allowed to remain half-an-hour, they were then taken out and dried, the dish washed, and then immersed for ten minutes in clean methylated spirit, kept moving about all the time, then removed and thoroughly washed for an hour in running water, then dried in a rack, when they were found to be as perfect as when originally taken.

Redevelopment of Negatives.

This very valuable formula was given to me by the oldest photographer of the day, Archibald L. Coke, Esq., of Clifton, by whose permission I am allowed to lay it before your readers.

1. If desired to make a negative only a little more intense, then make a saturated solution of bichloride of mercury, 1 ounce, to 20 ounces of hot water, soft or distilled. Take 2 ounces of saturated solution, add 5 ounces soft water.

2. Wet your negative under the tap, then immerse in No. 1, allow to get *slightly* white, or very much so if you require it very dense, or, being *very* thin, a mere shadow. Then wash for half-an-hour or more in running water—the water coming from a rose is best.

3. Next put in a tray, cover it with freshly-made *limewater*, and let negative stay in until all the mercurial salt is *reduced*. Wash again under the rose.

4. Make a solution of acetic acid (glacial), 5 drachms to 20 ounces; put in a tray. Take negative out of washing dish; drain until it shows as if pepper had been sifted over the surface. Just immerse for a few moments in No. 4, remove, and again wash under the rose. Then take out, dry in the rack, and collodionise with Mawson's enamel collodion, and it is complete.

With this simple process all stains are avoided. The lime being reduced by the carbonic acid of the atmosphere to a whitish deposit of carbonate of lime requires the acid bath to clear it.

If wanted more intense repeat the operation, or use the mercury stronger.

Limewater is made by putting fresh lime into a bottle a little at a time, fill up with water and shake well; when settled shake again. At end of each day fill up the bottle and again shake as before. Always *reduce* the salt of mercury *thoroughly;* result, a rich brown.

Scientific Development.

Allow me to again thank Mr. Harry Platt, U.S.A., for his excellent formula, p. 199, The British Journal Photographic Almanac, 1886.

ON DETECTIVE CAMERAS AND SMALL CAMERAS *VERSUS* LARGE ONES.

By A. R. Dresser.

As a great number of small or detective cameras have been put on the market this year in various forms, let us look at the advantage or disadvantage of using them.

First, in speaking of large cameras, I refer to 8 × 10 or 10 × 12, as larger

ones are used by very few amateurs. Now the disadvantage of using such large sizes are the expense and the great weight you have to carry, and for ordinary work where you have to walk some miles are more than one wishes to carry. The advantage, of course, is getting a large photograph of the subject you wish to take; but is the advantage really great to most amateurs (unless they go in for exhibition work)? as I fancy that one carries his camera about to get photographs of any subject that takes his fancy, as a reminder of his trip, and if so, surely a picture half-plate or cabinet size is quite large enough for all purposes.

Hence, to my way of thinking, a quarter or half-plate size is the camera most required by amateurs, and by using one of those sizes he can get a print from his negatives quite large enough for a memento, and should he at any time require one of, say, 8 × 10 size, there is no trouble, now we have so many bromide papers in the market, in getting one if he learns to enlarge. I speak from experience, as I take nearly all my negatives on quarter or half-plate and enlarge from them on 8 × 10 bromide or Alpha, and manage to get results to satisfy me and my friends without having to carry a great weight.

This summer I have been working a very great deal with an American detective camera, and have had so much pleasure from it that I should feel quite lost without one now. For a trip where you are going to be away for a few days and have no chance of changing plates, how handy to be able to have a camera that you can carry in your hand, and are able to use without having to focus or use a cloth. The one I use now has a roller slide which holds forty-eight exposures, and, besides, I have a bag to go over my shoulder to carry six double backs (quarter-plate), and so am ready for two or three days' work.

I found my American detective very good and by far the best I had been able to procure, but found many small faults, and so I set to work to try and alter them, and now (thanks to Mr. Thistleton, 1 Old Quebec Street, Oxford Street, who carried out my ideas) have a detective camera as perfect as I am able to make, and find it works as well as could be wished, having the advantages of having every object from twelve feet in front of lens to far distance in focus at $\frac{f}{12}$, covers clean to the edge of the plate, has a wide-angle lens, a shutter that gives from $\frac{1}{100}$ of a second to any time, said shutter and stops of lens are worked without having to open the case, with a plan of being able to alter focus if required from outside as well; and all this in a small space and very light.

I am sure one can take more pleasure in a camera of this sort than by using a large-sized camera and wearing himself out in carrying about a great weight, not counting the amount saved.

I think in the future there will be a great demand for quarter-plate detective cameras, if the dealers in such goods do not spoil the sale by asking, as they have done so far, such high prices.

TESTING EXPOSURES.—POTASH DEVELOPER.

By William Bishop.

The Editor's kindly invitation comes as a gentle but sometimes startling reminder that summer work is nearly over, and that the time has come for reckoning up and putting away for future use the opportunities and

their results which the season has afforded. But is there anything new to write about which wiser heads and abler pens will not already have exhausted? I fear not; so perhaps a few words on an old subject may be useful to some.

Inquiries are often made as to how the rapidity of the various shutters now so much in use may be tested. Methods of different degrees of accuracy have been given, but I have not seen described a mode which I have found both simple and successful in a series of testing observations. Let me note that exposures of fractional parts of a second cannot be measured in any rough-and-ready way; some care and preparation *must* be given or the results will be, as they deserve to be, worthless.

My mode of testing is as follows:—For apparatus, obtain an old clock (or a new one, if preferred; the most common kinds are good enough and cost very little) in which the works are fairly get-at-able, removing the pendulum and detent, so that when wound up the hands will revolve rapidly without the usual step-by-step motion. The hands are then to be taken off, and the dial either painted black or, better still, replaced by a larger dial of black cardboard with the minute divisions legibly marked in white, so that the circle is divided into sixty parts. It is of course better to divide into a hundred parts if the means for accuracy are available, but the dividing into sixty is easier. A white cardboard hand then takes the place of the minute hand, only one being needed. This is to be broad in shape, tapering to the end, which should be of such a width as to exactly cover one of the divisions.

Now for the works. If the clock be driven by a weight, the weight must be increased or reduced until it drives the hand round the dial once in a second; if by a spring, a brake will be needed, which may be easily supplied by a strip of soft leather folded round the spindle of the escapement wheel, and pulled as tightly as necessary by an indiarubber band until the required rate of revolution is obtained. It should be observed that single revolutions cannot be accurately measured; but if, when the hand is in full swing, a number be taken, it is easy to count whether, say, twenty revolutions are made in twenty seconds, and the average time of each will be very close to accuracy. This may seem to involve a great deal of preparation, but in practice it is very simple, and once done it is always ready.

All being thus prepared, put the clock up on the wall in a good light, arrange the camera to get as large an image as the plate will allow, and focus carefully for the divisions on the dial. Close the shutter, start the clock, and in the middle of the running let the shutter go. Develop to good intensity (for black and white) and print a proof. The image of the dial will be clear and sharp; the image of the hand will be more or less a blur, according to the distance it has travelled during exposure. From the extreme limits of the blur deduct one division, and the remainder will be the distance travelled and the time of working exposure. Thus, if the divisions be sixtieths, and the hand have spread over three divisions, the travel will be two-sixtieths, and the time one-thirtieth of a second. With one shutter I am using the travel is six-sixtieths, and the exposure one-tenth; and with another the travel is three-fourths of a sixtieth, and the exposure, consequently, one-eightieth of a second. Up to the three-hundreth part of a second this will work well, and equally so for exposures of greater rapidity, provided the delicacy of work and

speed of travel be regulated to meet the more difficult conditions. Two or three shillings will provide the apparatus, with a little of that ingenuity which comes naturally to all who are really interested, and the testing machine is always available.

It may be that the clock will not run fast enough to give even one revolution in a second. That is of no consequence if a definite speed be established, from which the relation of travel to time can be readily calculated.

Potash Developer.—During the year I have continued to use the potash developer described by me in last year's Almanac, in combination with the pyro solution also referred to, with increasing satisfaction, both for normal and (principally) instantaneous exposures. One point seems to come out, however, in practice which should be noticed—the necessity that the sulphite of soda be really good, as if at all decomposed by age or otherwise the shadows cannot be kept clear, and much crispness of detail is thereby lost. With good chemicals and reasonable care the developer in question appears to be all that can be desired.

PHOTOGRAPHY ON A HOUSE-BOAT.

By S. W. Woolley, M.P.S.

Notwithstanding the indignities that have of late been heaped on these innocent structures, which make them account for half the filth in the River Thames, it is very evident that such sweeping condemnations can only proceed from persons who 'run them down' without any personal knowledge of the usages on board a house-boat. When first they came to be used as crafts of pleasure, coal-barges unfit for work were converted into floating residences, but of late years, owing to the demand for them, the construction of a house-boat involves as much architectural detail as a small house, and is usually found fitted up in a most comfortable manner, in many cases positively luxurious.

It has been my pleasure to spend a few months on board one of these crafts, and with lively companions and the inevitable camera the time passed away all too soon. For a dark room the saloon, by closing the shutters and the judicious use of blankets, was easily converted, if not into a perfect dark room, at least into one which answered for developing. Having previously laid in a good stock of plates and plenty of concentrated developer, the first thing was to get used to the light, which, from the clearness of the atmosphere, is considerably more actinic than in town; in fact, I found 'ordinary' plates amply quick enough for shutter work.

The subjects for the camera are both numerous and varied, some of the prettiest photographs in my collection being instantaneous ones of the 'rollers' at Teddington Lock, which when in the busiest time is covered with pleasure-seekers of both sexes in picturesque boating costumes and in attitudes as artistic as they are difficult to reproduce, the variety of colour making one long for the invention of 'photography in colours.'

The rural villages dotted along the banks came in for a share of the camera's attention, nor were the more stately scenes, such as Hampton Court Palace, neglected. I spent one Saturday afternoon in taking 'stray shots' at passing boats from the saloon windows, and obtained some

novel effects. From the deck of the house-boat pleasure-steamers and coal-barges were taken, more for amusement than picturesque effect. The hospitality of a house-boat is quite proverbial, and indeed it is surprising the number of people that can be accommodated if necessary. The poop of the vessel, though of limited capacity, was a favourite place to give teas on, and it invariably causes a smile when one gazes on a photograph of the merry tea drinkers evidently enjoying their *al fresco* meal. It being the usual thing for house-boats to go to Henley Regatta, thither we went, and perhaps a more favourable opportunity of acquiring interesting photographs does not offer itself than Henley week, with its unequalled display of aquatic costumes. Alas! there are river scenes which no camera can depict; for instance, the peaceful scene when seated on the deck on a moonlight night watching the graceful curling of the smoke of the last cigarette before turning in, and with the quiet only broken by the distant croak of the moor-hen, a scene as difficult to describe as to photograph.

Her Majesty's Jubilee was an excuse for illuminations on a small scale, and a very pretty sight the boat presented when lit up with Chinese lanterns and 'fairy' lamps, which, with the reflection in the river, make a most picturesque scene.

In concluding this let me recommend any one with the leisure, or a desire for laziness, to spend a few weeks with the camera on a house-boat, and I can safely say they will never regret it.

A USEFUL MOUNTING MEDIUM.

By Chas. A. Parker.

The following mounting medium, which will keep for months, is very simple to prepare, and may prove useful to those who wish to have something ready for use at a moment's notice, as it does not thicken and possesses adhesive qualities equal to glue.

Procure half an ounce of the finest white gum arabic and carefully pound this to a very fine powder in a mortar, then mix with it about three times its bulk of dextrine, adding about a couple of ounces of water so as to form a thick, smooth paste, finally dilute it with five ounces more water, and then boil by means of a water bath for fifteen minutes, stirring it continually all the time. It may then be poured into a wide-mouthed bottle, and after the addition of five drops of ammonia is ready for use. A stiff brush inserted in the cork will add to its usefulness.

A POTASH AND SODA DEVELOPER.

By H. Y. E. Cotesworth.

Many people like potash as a developer, except for its unfortunate frilling propensities. I myself must own to an affection for it, and consequently I have gone somewhat out of my way to find a means of retaining its services. It is no great secret, but it answers the purpose well, the formula that I have settled upon, consisting of carbonate of potash, chloride of sodium, and pyro. The anti-frilling properties of salt have been long since established, and the fact that it has very little slowing

effect in development has also been recognised; so why not combine it with potash, or, rather, carbonate of potash, which forms a good developer for plates that have no tendency to frill, and make it suitable for those that do frill?

My formula is as follows:—

Carbonate of potash (dry)	4 ounces.
Chloride of sodium	4 ,,
Water	1 pint.

Dilute with three parts of water, and use with the ordinary ten per cent. sulpho-pyro solution reduced to three grains to the ounce, mixing the solutions in equal parts. The development is slower *in commencing*, but goes on rapidly when it does start, and so far as I have noticed, no increase of exposure is necessary. In fact, I think that in cases of under exposure I can get more out of the plate with this development than with the ordinary pyro and ammonia.

If used in connexion with ammonia, the chloride of sodium does away with the necessity for restraining bromide, except under very extraordinary circumstances, and for ordinary purposes I think leads to shorter exposures.

STRIPPING FILMS, AND OTHER MATTERS.

By John A. Hodges.

I have always been an advocate for the use of a small camera for tourist work, and subsequent enlargement from the small negatives obtained, and another year's experience has not in any way caused me to alter my opinion upon this subject. Although, with the perfection to which the various negative papers and films have been brought during the past year, there is certainly less objection, on the score of weight, to the working of a large camera, yet the introduction of stripping films and the vast improvements made in gelatino-bromide paper for enlarging are, to my mind, two points strongly in favour of working in the manner I have indicated. I hold the opinion that an artistic enlargement, the execution of which has been carried out in a technically perfect manner, possesses beauties which cannot be equalled by any process of contact printing from the original negative. A glance at the walls of any of our photographic exhibitions, where contact prints and enlargements from the same negatives are frequently exhibited, will, I think, go far to justify the truth of this observation. In an enlargement there is an absence of that microscopical sharpness which is so distressing to an artistic eye, and which is so out of place in many subjects. On this point I would remark that the very perfection to which the materials with which we work have been brought, has really caused us to retrograde instead of to advance. It is a continual and everyday cry with many, 'What lens gives the greatest depth of focus?' 'I am obliged to use small stops in order to get the foreground and the distance both sharp.' Vain delusion! for if this be done all aerial perspective and breadth must vanish. Make your principal object as sharp as you please, for it should be so, but aim at nothing more, and then your middle distance and your distance will have that vague, indefinite, aerial perspective which is the charm of some of the best work hung upon the walls of our exhibitions.

With the advent of commercially prepared negative paper, I was last season tempted to work a large size camera; but, apart from the question of the excellence of the results obtained, I found so many inconveniences arise in working, that I was glad to again avail myself of the many advantages offered by a small camera. Perhaps a few notes on the method of working which I have adopted this season may be useful to some of 'ours.'

In the first place, I have had a quarter-plate long-focus camera fitted with an Eastman roll holder, and have used therein the new stripping films, about which I have a few observations to offer. Any detailed description of the process would of course be unnecessary, as the films have now been before the public for some considerable time, and everybody is, more or less, familiar with the process. As regards convenience, the use of the roller slide of course offers great advantages over the ordinary double backs, and in practice I can conceive nothing more convenient The character of a negative on a stripping film leaves little to be desired, particularly if it be backed by one of the matt-surfaced skins supplied with the films, the fine ground-glass effect produced greatly enhancing the printing qualities of the negative. As regards rapidity, the film has proved not to be so rapid as some plates of English manufacture, although I am aware in this respect my experience is the reverse of some other workers. To successfully work stripping films one must be constantly on the alert at every stage of the process, and, if anything like method is adopted, the process is neither a tedious nor a troublesome one. A little judgment is necessary in development—the temporary paper support, as in the case of a paper negative, giving the negative when viewed by transmitted light an appearance of greater density than it really possesses, allowance must therefore be made for this. In my hands any developer works well on these films, but, used with judgment, the potash developer will be found difficult to beat, giving as it does a great range of tone and gradation, and withal softness, which are essential qualifications of a good negative. Of course in a stripping film negative from the moment it is squeegeed down to the prepared plate there is an element of uncertainty as to whether the finished film will be a success or a failure. The greatest difficulty which I have encountered has been that the film on drying has partially left the glass, and has consequently buckled and puckered. To avoid this danger it is necessary—1. To see that the glass plate is chemically clean and free from grease; and to insure this, I well rub each plate with a mixture of methylated spirit, 5 ounces; liquor potassæ, ½ ounce. Thoroughly rinse under the tap and then polish with methylated spirit, 6 ounces; liquid ammonia, ¼ ounce; water, 6 ounces; tripoli powder, ¼ ounce; well shaken before use. 2. The indiarubber solution must be very thin and prepared with the purest benzine obtainable, commercial benzine frequently being contaminated with fatty matter. 3. The collodion also must be prepared with a high temperature pyroxyilne, and with pure samples of alcohol and ether. To neglect these precautions is to court failure. I have found the premature peeling tendency of the films—if I may use the expression—has been very much lessened by soaking the skins in a mixture of methylated spirit, 2 ounces; water, 4 ounces; glycerine, ¼ ounce—a method which I believe the Eastman Company now advise those using their films to adopt.

Dear Mr. Editor, I see your frown, but I really am going to stop. I

was going to dilate on the superior results to be obtained in enlarging from these films, and upon other matters. But after all, this humble contribution is not THE BRITISH JOURNAL PHOTOGRAPHIC ALMANAC by J. A. Hodges, but simply an honest endeavour to guide the steps of those who contemplate the adoption of a new and fascinating process.

In conclusion, though I trust it may be unnecessary, let me state that I have no object, pecuniary or otherwise, in vaunting the wares of the Eastman Company. They are at present, I believe, the only commercial makers of a stripping film, but no doubt the spirit of competition of the present age will stimulate other manufacturers to compete with them, and if other 'strippers' appear, I shall be the first to give them a fair trial in the hope of attaining a result even better than that to which I have already attained with the materials at present at my command.

THE CAUSE OF BLISTERS.

By W. H. SHERMAN (Milwaukie, Wis.).

WHAT is the immediate cause of blisters in albumen prints still remains, I believe, an unanswered question. A theory, to be of value, must have a basis of fact. It is superfluous to discuss any theory of the formation of blisters on the assumption that they are filled with a part of the liquid in which they are immersed, while the fact remains that they are filled with gas. This indisputable fact must be the starting point of the true theory regarding their origin.

Now, as I desire to lead the reader of this article to the same conclusion that I have arrived at, I will ask his attention to certain circumstances which appear to have an important bearing on the question.

First, it appears that the highest and best grades of albumenised paper are, as a rule, the most liable to blister. Second, the earliest stage in which they make their appearance is after they are placed in the fixing bath. In recent years I have not seen an exception to this rule, although in the early days of albumen paper I believe they sometimes occurred before they went into the fixing bath. Prints washed and salted ready for toning may be kept in water two whole days at least before they are toned without showing any liability to blister. Third, when the blisters appear in the small, semi-shot like form in the hypo bath, or in the first wash water, if taken out at once and dried the prints may afterwards be washed with safety. This appearance is generally a prelude to an aggravated case of blistering in consequence of the small sacs becoming confluent, thereby completely ruining the prints. A fourth circumstance, probably nearly related to the first, is that sometimes unpreventable blisters occur when an unnecessarily strong silver bath is used, and the trouble will entirely disappear upon merely diluting the bath.

Putting all these circumstances together and considering their relative bearings, I came to the conviction that some gas was generated in the fixing bath which under some conditions caused the splitting of the albumen film from the paper, while under other conditions it escaped through the pores of the paper without injury to the prints. The next question which naturally suggests itself is, What gas is it which causes the mischief? The very unstable organic substance, albumen, which is always present, coupled with the fact that the greater the quantity the

greater the liability to blister, led to the strong suspicion that carbonic acid gas was the active agent. To test this, a number of prints with large blisters were placed under clear lime water and broken with a glass rod. Bubbles of gas arose through the liquid and burst at the surface, over which a perceptible scum was formed. The solution was at once poured, scum and all, into a bottle and tightly corked. A white precipitate was found to have been added to the lime water, which was redissolved by acetic acid, showing the strong probability that the precipitate was carbonate of lime.

Next, with the view of approximately locating the time of the liberation of the gas, I tried the following experiment:—

Taking an unfixed print of sufficient size, I gathered it up around an inverted funnel, fastening it in place around the neck with a string. The mouth of the funnel being supported on the bottom of an evaporating dish, the funnel was nearly filled through the neck with a solution of hypo, and the outer vessel filled with water to the level of the liquid in the former. Here, then, was a bag made of an albumen print (albumen side in) filled with hypo fixing bath and immersed in water. Observe now what follows. Soon bubbles of gas began to rise, copiously as to numbers, and continued for some minutes, presumably until the fixing was completed.

In the next place I repeated the experiment exactly, substituting in the place of the albumen print a dried ox-bladder, which was of course first soaked in water to render it flexible. The evolution of gas took place in this instance precisely as before.

Now, if we suppose that one of the first steps in the decomposition of organic matter is the oxidation of the carbon, which is its chief constituent, and, further, that the same thing happens in the albumen film either before or during the printing, that is to say, that a carbonate, or better still, a bicarbonate is formed (perhaps *behind* the surface exposed to the light), we have an inferential clue to the seeming mystery of the gas.

It seems to me that the non-appearance of blisters during the prolonged soaking in water before toning and during toning, and the almost certainty of their appearance during or soon after fixing (unless a preventive be used), are, in connexion with the experiments cited, strong evidences that the gas is liberated by the action of the hypo.

The inference then follows that the gas is always formed whether the prints blister or not. This inference is supported by the universal practice of photographers, who when using highly albumenised paper, never run the risk of omitting the salt from the first water into which they are transferred from the fixing bath. Another proof of this is, that a newly fixed print on such paper can be invariably blistered by holding it on the warm hand and letting water run upon it from the tap.

The reason that incipient blisters are cured by drying the prints probably is that the gas escapes through the pores of the paper during the operation of drying, while the styptic property of common salt, together with the greater density which it gives to the water, allows the same thing to happen when it is used in the water without disruption of the albumen film from its support. In like manner the density of the fixing bath may afford an explanation for the infrequency of blisters happening in it.

To sum up. The conclusion to which I have arrived is, that blisters

are caused by carbonic acid gas, which is always generated in albumen prints by some chemical action which takes place in the fixing bath, and that the prevention of blisters in highly albumenised papers consists in making conditions which allow the gas to escape through the pores of the paper. The addition of common salt to the water in which the prints are placed is one, and probably the best, method of prevention. Alum will do the same thing, but as a remedy is worse than the disease. The addition of carbonate of ammonia to the hypo bath greatly helps the prevention of blisters by neutralising the carbonic acid as it forms. Its use in the hypo bath cannot be too strongly recommended, both for this and other reasons which have been often given.

THE COMPOSITION OF THE LATENT IMAGE.

By J. Barker.

We have had some very interesting papers in The British Journal of Photography upon the constitution of the latent image, one or two of which have been somewhat sharply criticised; but I hope that the fear of criticism will not deter writers from continuing their praiseworthy task and giving us the benefit of *any* theory they may have formed upon the subject, for honest criticism is advantageous in elucidating the truth, whilst your rude dogmatic critic is a person that may safely be ignored. And certainly any one that attacks unknown ground deserves the thanks of all seekers after truth and knowledge.

But I take it that we shall never solve this problem unless it is attacked from certain fixed, definite standpoints, which are often disregarded, and it seems desirable to point out that not only is the result of any given light different upon each of the haloids, but also the result of the action upon any given haloid varies in accordance with the kind and, to a certain extent, the force of the light used. Also few are sufficiently explicit as to their definition of 'organic matter,' for there is an essential difference between, say, organic salts, the carbon compounds, and organized matter. Although it is, perhaps, somewhat difficult to give an exact definition of the distinction between the two last, yet we know that there is a difference, although the constituents may be the same in both cases, for we see a vital principle, or, as some might prefer to designate it, an inherent tendency in the one form of matter that is not found in the other.

So far as I can see at present, the organic salts seem to make a more stable image than the carbon compounds when in combination with silver, but this is a point that requires further investigation.

GELATINE DRY PLATES FOR PHOTO-ENGRAVING.

W. T. Wilkinson.

I have been so often asked if it were possible to use gelatine dry plates instead of the wet collodion as described in the *Photo-engraving and Photo-lithographic Manual*, that I have been induced to make a series of experiments, but can only find one make of plate in the market quite suitable

for the purpose, viz., England's slow landscape plate, although Wratten's ordinary plate runs it very close.

Of course for anyone who is making phototype blocks regularly, the wet collodion process is the best, both in point of cheapness as well as certainty, but for those who only require to make a block now and again, dry plates offer many advantages, it being a well-known fact that it is far more difficult to keep a silver bath in good order when only used occasionally than when in regular use, but a dry plate with proper storage is always ready.

Now the characteristics of a good negative suitable for printing upon zinc for subsequent etching in relief, are a maximum of density with a minimum of veil or deposit in the lines. In a wet collodion plate, artificial means have to be adopted to secure density, clear lines being easily obtained; but in a dry plate, to obtain density there is no trouble, but to keep the lines clear requires the exercise of a great deal of skill, and patience, and thought.

With the usual brands of dry plates sold for portrait work and described by the makers as yielding negatives full of half tone, it is impossible to get a negative suitable for printing from upon a zinc plate, they being too sensitive and also too much prone to veiling in the shadows; therefore a plate must be used that is not so rapid, and which, unless really well exposed (to a half tone subject), will not give the proper gradations of half tones, in fact, as near to a wet plate as possible. These conditions the plates named above amply fulfil, and if care be taken, negatives may be made for zinc printing equal to the best wet plate.

To attain this end, the following developer is recommended:—1 ounce of bromide of soda is dissolved in 40 ounces of water and 10 grains of citric acid added and also dissolved; then add 1 ounce of pyrogallic acid, and label No. 1. This solution will keep three months at least.

Solution No. 2 is a saturated solution of carbonate of potash.

The plate must receive such an exposure as with the ordinary developer recommended for the plates would be over exposed.

The development being effected by soaking the plate in sufficient of No. 1 to well cover it for at least 30 seconds, then pour into the glass measure about 5 minims of No. 2; pour the solution No. 1 from the dish into the No 2 so as to well mix it, then return to the dish containing the plate, and keep the solution in motion by rocking the dish gently to and fro (keeping a sharp look out for air bells). If this makes the picture appear, do not add any more No. 2, but allow it to act until all details are out and the density is sufficient, then wash thoroughly back and front and place in the hypo fixing bath; but if after the interval of a minute the image does not appear, put 10 minims more of No. 2 into the measure, pour the developer into it and again return to plate. This should fetch it; if not, try another 10 minims, and so on until the negative is properly developed.

After fixing, wash well, then flood with a little of a solution:—

Saturated solution of alum	1 pint.
Saturated solution of sulphate of iron	2 ounces.
Hydrochloric acid (commercial)	2 ,,

Again wash, and if the negative is wanted at once, blot off moisture by

placing between sheets of fine linen, then flood with spirits of wine (methylated) and place to dry in a cold, dry draught.

A word or two upon the light of the dark-room window. Get two sheets of canary medium and make transparent with either olive oil or vaseline, and cover the window with the two thicknesses, and although the operator can read minion type, he need have no fear as to his plates fogging.

HOW TO COLOUR A LANTERN SLIDE.

By Albert Wm. Scott.

A few months ago a series of five articles on 'Colouring Lantern Slides' appeared in The British Journal of Photography over my signature, in which full particulars of the pigments, brushes, &c., required, and the method of using them, were given. I have received letters relating to this series, in which it was suggested that a supplementary chapter or two should be added, giving a description of the painting of a lantern slide from start to finish. I propose now to act upon the suggestion.

We will take a slide belonging to a favourite set manufactured by Mr. York, of Lancaster Road, Notting Hill, London, and which can be obtained from any lantern dealer. I refer to the set of nine photographs from 'life models' entitled *Curfew must not ring to-night*, and we will now in imagination proceed to colour No. 2 of the set, which will serve as a model for most of the remainder.

I shall assume the possession of all the materials required, viz., the easel, oil colours, three small brushes of the kind known as water-colour sables, also good sight and patience. The first thing is to remove the plain glass which protects the photograph. This is easily done by cutting away the black paper binding with a penknife. The back of the glass being made quite clean it is placed upon the easel; a sheet of white paper laid horizontally behind will enable us to see the progress of the work. A white china palette is at the right of the easel, also a tube of Roberson's magilp, an egg-cup containing turpentine, and a bottle of mastic varnish.

The oil colours required are Prussian blue, crimson lake, yellow lake, burnt sienna, asphaltum, verdigris, and lampblack. A little Prussian blue is put on the palette and mixed with an equal bulk of magilp by the tip of the third finger of the right hand.

The scene before us is an open landscape, with the sun setting near the horizon, which is composed of distant hills. There is a fortress in the middle distance, two trees on the right foreground, a footpath in the centre, upon which are two figures, the old sexton and the heroine of the poem, a young lady who is supposed to be saying,

'I've a lover in that prison!'

This sweetheart of hers is condemned to die at the ringing of the curfew, and she is asking the sexton not to sound the fatal bell.

The sun being in the picture it is necessary to assume the presence of a slight mist, otherwise its brilliance would be unbearable. Through the haze the sun would appear as a bright yellow disc on an orange ground; this orange tint would be richest and brightest near the sun, and would become paler as the distance increases, melting imperceptibly into a dark

blue at the top of the picture. The little streaks of clouds near the sun are of an orange tint; the large cloud on the left would be grey in the upper half, dark purple on the lower, with the edges facing the sun of a brilliant orange colour. The tiny clouds at the top would be grey above, orange below, while the cumulus on the extreme left would be a greyish purple.

The horizon just under the sun would be darker than in other parts, and the trees would stand out nearly black against the bright sky, especially in the foliage nearest the source of light.

In colouring landscapes the first thing is to put on the sky tints, and do all other 'dabbing' work; afterwards to remove the dabbed colour from those parts where it is not wanted; and, finally, to finish with the brush. In the present case we had better complete the sky before attempting the rest of the picture. The clouds and shadows being sufficiently indicated in the picture we need not break down the colours; we will keep them as pure and bright as we can.

After mixing the Prussian blue with the medium on the palette, a little of the paint will remain on the finger-end; no brush or turpentine is needed, for by gently dabbing on the sky part the paint will be transferred to the glass, and the tint made perfectly smooth and even by the finger alone. The skin should be kept as soft as that of a lady's hand, hence the artist who does rough work occasionally ought to wear a finger-stall, to prevent the skin becoming furrowed and horny. Some rub away the rugosities of the skin by means of smooth sandpaper. This makes a temporary improvement, but in a day or two the skin will be far rougher than at first, so I do not recommend the plan. The blue tint should not be intense, even at the top, where it is deepest, while it should become fainter as it nears the sun, and should cease altogether when half the sky space is covered.

The lower half is coloured with a warm tint, which should melt imperceptibly into the blue without leaving any white space between. This warm tint is to be the brightest orange we can make; in oils the best is a mixture of crimson lake and yellow lake. These colours have little intensity, and do not 'dab' well, but they can be improved by adding an equal bulk (or less) of mastic varnish. This tint is applied in the same way as the Prussian blue, the finger having been perfectly cleaned from the latter. The colour may at first be dabbed right over the sun and clouds. When the main tints are made as smooth and even as we can get them the stump will clear away the superfluous part. A stick of hard wood, such as boxwood, the size of a cedar pencil, is cut to a chisel point; over this is stretched a piece of very soft washleather, the ends of which are held in the fingers which hold the stick.

When the end of this stump becomes charged with paint the leather is shifted to bring a clean portion to the point. With this tool the sun and the bright edges of the clouds are cleared of colour; if the clouds look too dark the colour may be removed from these also, leaving them of a grey tint, which will be quite natural. However, we must be careful not to upset the arrangement of light and shade in the photograph by making the clouds lighter than the sky. If this should occur a mere trace of lampblack, thinned with magilp, should be dabbed over the large clouds. The golden edges of the tiny clouds at the top may be cleared with the sharp edge of the stick, from which the leather is removed.

Now we are ready for the brush. The sun is coloured with yellow lake, mixed with just sufficient mastic to render it liquid, the golden edges of the clouds are touched with a mixture of yellow lake, madder lake, and mastic varnish. These should dry with a level surface, and the edges be thin and free from hardness. The clouds nearest the sun may be put on with the same orange mixture, while a purple, made with Prussian blue and crimson, will tint the cumulus on the left horizon and the lower part of the large cloud; the extreme edges of the latter are of course bright golden. This completes the sky.

The foreground, being bathed in a flood of yellow light, has well-developed, warm tints in the lights, while the shadows should tend to purple. The footpath may be dabbed with burnt sienna and yellow lake, with a trace of mastic added, the grass and foliage with yellow lake and verdigris, applied with a brush. These two latter colours should be varied in proportion, the lights being made yellowish, the shadows bluish green. We must also put the paint on thickest in the shadows, so as to preserve the light and shade.

The horizon on the left may be pale green, in the centre the same colour, but darker, especially at the upper edge; the distant hill on the right pale purple. The fortress may be slightly tinted in the shadows with purple, the outer walls with burnt sienna.

The trees on the right should be dark brown—burnt sienna and lamp-black mixed—in the trunks, dark green in the foliage—burnt sienna and Prussian blue mixed. When I say dark I do not mean opaque; the details should be distinctly seen through the pigment. If the slide is lightly printed it may be necessary to touch up the minor shadows of the trees with a deeper colour.

We come now to the figures. The stump having removed every trace of colour that may have spread on to them in the dabbing process, we can tint the young lady's face and hand with a mixture of crimson lake, yellow lake, and mastic; under the circumstances it may be as well to omit the rosy flush which is considered, I believe, to be proper on beauty's cheek; suspense and fear would doubtless cause it to be temporarily absent. This does not hold, of course, in the case of the round-shouldered sexton, whose face, being turned to the west, is consequently out of sight; there is only one ear and his fist visible. These can be tinted with the same mixture we used for the lady's complexion, but applied thicker. The lady's mantle, being cut after the pattern worn by Red Riding Hood, may be coloured scarlet—crimson and yellow mixed—without outraging fashion, while the dark dress can be tinted with Prussian blue, the colour being laid on thickest in the shadows. The relentless gentleman's overcoat can be left as it is, grey, the hat tinted with blue. The hair and whiskers may be white, with a suspicion of purple in the shadows. A little purple may also be dabbed on the gravel path, to represent the shadows thrown by the sun.

The slide, being coloured up to the point when any further touches seem of doubtful advantage, may be considered as completed. We may put it to dry under a glass shade, or in some other place free from dust, for two or three days; if there is not time for this it can be mounted at once if great care is taken not to smear the paint, the black paper mask being thick enough to prevent the glasses touching. The mat being laid over the painted picture the plain protecting glass is thoroughly cleaned

and placed on it; then a gummed strip of black binding paper, which can be bought of the optician's, is pressed round the edges with a linen cloth. Gum arabic mucilage by itself dries too brittle for the cement, but if about one per cent. of treacle is added it will adhere very well. The edge of the glass should be thinly gummed in addition to the paper, to secure the best result.

A RELIABLE DEVELOPER FOR GELATINO-CHLORIDE PLATES.

By Clement J. Leaper.

Dissolve one ounce of pure citric acid in four ounces of distilled water. Measure out four ounces of the solution so formed, reserving the other portion, and neutralise the four ounces with solution of ammonia (liquor ammoniæ), adding it carefully in small quantities at a time, and testing with litmus paper after each addition. When perfectly neutral add to it the reserved portion of citric acid solution and five grains of common salt. This forms the solution of ammonium citrate.

A solution of ferrous sulphate is now prepared by dissolving two drachms of the salt in one ounce of distilled water, acidified with a drop or two of sulphuric acid.

To develop, use three volumes of citrate to one of iron.

INCIDENTS IN THE TREATMENT OF CUSTOMERS.

By Friese Greene.

The little incidents related herein will show the varied treatment and care required to be exercised by photographers of the present day towards their customers, and will serve as another illustration of successes that are attained by apparently small beginnings.

Soon after opening business at one of my studios one morning at half-past eight, a man appeared who wanted his photograph taken. Only one photograph was required, and the sum he offered was less than my published list price, as he said he could not afford more. I humoured him and took him, sending the photograph—on a day he named when he would be far away—to an address he gave me. A day or two after, I heard from the party to whom it was sent. This turned out to be his wife. He had married while he was out of work, hoping to rub along on the small income she had till times were more favourable; however, opportunities failing, he determined to try his luck abroad, and had already left his wife and was going to his ship the day he called on me. The photograph I sent was the only clue his wife had of his whereabouts after he left her in the early morning, and she wrote me wishing to know what I knew of the gentleman. The little I knew I told her, and as I suppose absence made the heart grow fonder in this case, she wished an enlargement made of the photograph, and also required other copies, so that if needed they could be used for tracing him. This order I had the pleasure of executing, so that in this case I had profited by a temporary deviation from my rules—not only by this order, but several re-orders I have received since. So this will show, in one sense, that it is not alone competition of price, but competition of intellect that is required by those who would be successful in business.

Another incident will show one mode of advertising. A nurse with a little child in a perambulator was looking at my show-cases one day, and as the carriage stood just at the entrance I could not pass to go into my studio, so I remarked to the nurse that a group of them would make a pretty picture. She eagerly asked me if I would take it, and I readily assented, thinking a photograph of the pretty child, also, would be an attraction. The promise of a copy delighted the nurse, and she soon brought the child inside. After a few days she called for the promised picture, and shortly afterwards I received a good order from the little one's father. Well, I thought this was rather good; but this was not all. The nurse required her photograph and also her friend's, so that in a few days the mistress of the house had before her several specimens of my work. Then followed the other children, and, lastly, the master and mistress themselves, the negatives of whom have been constantly in the frames for re-orders since, to say nothing of enlargements and out-door work I had done for them, so that in this case I have done something more substantial than simply gratifying my wish for a pretty picture.

Another time a laundress brought in two photographs—both of soldiers—to be copied. She seemed in trouble, and a little sympathetic treatment soon brought forth her tale of woes. The two soldiers were her sons, and had both fallen in the Soudan. These, her two brave sons, the pride of her life, to whom she naturally looked for sympathy and comfort in her own declining years, were taken from her at the early ages of twenty-three and twenty-one; and to make matters worse, about the same time her daughter and only remaining child, a girl of nineteen, met with a severe accident, a blow from a flying tipcat depriving her of the sight of an eye. I listened to her tale, and a little sympathy pleasing her, I had a better order than she at first thought of giving, and though in a humble station of life, she has been able to give me many a good recommendation since. Copying may be to some unsatisfactory work—they would prefer a pretty girl in stylish dress as a sitter—but I have no reason to be dissatisfied with myself for either taking the copies or proffering sympathy.

Before the *Atalanta* started on her last ill-fated voyage, one of her crew came to me about nine o'clock one morning to make an appointment to photograph a group; an hour or two later he was on his way to the church to be married, about eleven o'clock, to his girl-bride of sixteen, and patting her on the cheek he exclaimed he would make sure of her while he had the chance. From my studio he went to join his ship, bidding adieu to his pretty little wife for three years, though hopefully looking forward to a happy meeting afterwards. The vessel was lost, and I scarcely ever felt more truly sorry for a fellow creature than I did when the girl-widow came to me after the wreck to order some more copies of the group taken on her wedding morn.

The romance of photography is really so great that anyone who strives to grasp it can have ample matter for thought and reflection. For one customer of mine I did a gelatino-bromide opal picture, and I told her that I believed them to be permanent; but what was I to say when some time after she called and told me that being annoyed by a speck of dirt on the face of it, she had taken it out of its frame and washed it, rubbing a pretty gap in the subject's nose? For once I was at a loss for words, for I had

certainly not dreamed of water and friction being applied. What was I to say?

One more view of photography I may take, and that is with regard to resits. In the case of a group I had posed according to my judgment, it was not considered satisfactory because the one who was thought most of by the rest was not placed by me in the group as its centre ornament; so I swallowed my scruples and took them again, as requested, making more of an amusement of it than a hardship, and pleased them this time—but mind, for my own part I still think the first picture was the best.

We must put ourselves in the position of our customers, and though we may think that most are now educated up to the point of knowing a good photograph, it is not so; youthful and unformed tastes and ideas will, in many cases, govern your customers in their choice. A photograph may often be displeasing to the customer while highly pleasing their friends. Which is the most satisfactory in this case—to give a resitting or refuse? I know, for my part, I would rather have the good opinion of the sitter, as well as their friends. It is indeed a difficult thing to see ourselves as others see us, and as a photograph is the exact reverse of what they see in their mirror, it is no wonder that some will find defects where they do not exist. We, looking at things in a mercantile aspect, must so contrive to be pliable to all to make business a success, for to please the public with what we really think good work will very often not keep the pot boiling—we must contrive to please all tastes. For the wish of a commercial man is power, to be applied in one direction or the other, and money is power. So that if resits are given, though unsatisfactory at the time and still more so when against your better judgment, you will reap the benefit of it in later years and establish your name as that of a man whose aim and endeavour is to give satisfaction to all.

A SIMPLE METHOD OF MAKING REVERSED NEGATIVES.

By E. W. Foxlee.

Photographers who have no special appliances for the purpose, sometimes, however, require to produce reversed negatives for one or other of the photo-mechanical processes. There is a simple and reliable method by which this may be accomplished, and although it is not absolutely new, its advantages in this direction are not so widely known to professional photographers as they deserve to be. I allude to the use of the 'Eastman stripping films.'

The films may be used in the ordinary dark slide with the carriers sold for the purpose. These carriers, though convenient, are not indispensable, as the film may be simply laid in the rabbet of the slide, and backed up with a glass plate to retain it in position; or it may be attached to a glass by its edges with indiarubber solution or other adhesive material. After exposure the image is developed in the same way as an ordinary dry plate, and with any developer that may be in general use. When the negative has been fixed and washed, a glass plate is taken and coated with plain collodion, and when this has set, it is immersed in a dish of water to wash out the ether and alcohol. The still wet negative is now squeegeed, face downward of course, on to the

collodion film. The plate is then put away between blotting paper, under pressure, for a quarter of an hour or so, precisely as in the case of chromotype printing. Next the plate is placed in a dish of warm water —say at about 120° or 130° Fahr.—when, after a few minutes, the paper will float off, leaving the image firmly attached to the collodion. Should the negative be found to require intensification or reduction, it may be treated in just the same way as if it were taken on an ordinary dry plate.

By this simple method we obtain a reversed negative which is as free from grain as if it had been taken direct on glass, and there is no film of gelatine or other translucent material to print through and thereby interfere with the sharpness of the print. If the plate be rubbed over with French chalk, or coated with a thin solution of indiarubber, before collodionising, then, after the negative has served its purpose as a reversed one, a sheet of gelatine may be applied, and the whole stripped off. The negative can then be used for silver printing, or any other purpose for which a non-reversed negative is required. In this form the negative will serve a dual purpose. It is scarcely necessary to mention that if the negative has to be printed on to a rigid surface, as in the case of collo- type, the glass to which the film is transferred should be patent plate, so as to avoid fracture or want of contact in the printing.

Often reversed negatives of paintings are required, and as orthochromatic, or other plates prepared for stripping, are not supplied commercially in England, the stripping films at once supply the want. All we have to do is to pass the films through an orthochromatising solution and dry them. They are then in the same condition, as regards colour sensitiveness, as if they were dry plates similarly treated. If, after colour sensitising, they were simply hung up to dry, they would become cockled, and a difficulty might be experienced in getting them perfectly flat again. This may be obviated by simply squeegeeing the wet film on to a sheet of ebonite, or a French-chalked glass, and allowing it to dry on that. It will then become as flat as it was at first. If time be pressing, the wet film may be squeegeed face upward on to a glass plate, and exposed without drying, care, of course, being taken that all the surplus solution is removed from the surface with blotting paper.

I am not quite certain that the colour sensitiveness is so great when the film is exposed wet as when it has been dried, but at present I have not detected ady difference.

HINTS FOR LANDSCAPE PHOTOGRAPHERS.

By G. Foxall.

In making choice of a camera always select one with a screw for focussing, *not* a rack, for after a time, when the rack becomes a little worn by friction, the pinion will slip along the rack and so alter the focus; even the putting into its place the dark slide after focussing may cause this, especially if the focus of the camera is stretched almost to its greatest extent. You can be always sure of your focus if you have the screw. My present landscape camera has a screw, and I have had no trouble at all with it for six years, although it has had some very rough usage; but have used myself, and seen in the hands of friends, these cameras with screws, and find they are almost a constant source of trouble. It is not

at all pleasant to have to stick into the camera your penknife, or wedge with a piece of wood after you have focussed.

Be sure and have a reversing back to your camera, so as to be able to take a picture, either horizontally or vertically, by simply twisting it round, instead of having to unscrew the camera and screw it again upon the stand sideways; for I have never seen a camera yet that really did well this way, or was firm on the stand, most landscape cameras having been made to take pictures principally horizontally. The camera of course has to be square for the reversing arrangement, but the extra weight is but little.

Always use a strong, if rather heavy stand, for it is best to even make your arm ache a little in carrying it than find you have one or two of your most prized negatives with double outlines, caused by the vibration of the camera during exposure; for a very little wind will shake a light stand, or you may shake it yourself in removing the cap, or in using one of the many forms of shutter.

Have the camera screw attached to the head of the stand with a small *swivel* chain; it is always there when you want it, and cannot drop into long grass and other places, or be put on the ground when you are packing up and left there, to your great trouble, perhaps, in a quarter of an hour. The camera looks bad, and makes one feel foolish to see it tied on to the stand with a thick piece of string. This reminds me, always when out with the camera be sure and have plenty of string in your pocket, it may come in useful in case of accident to the camera or stand, and is very useful sometimes to tie out of the way, in your immediate front, branches of trees, &c., that you might get into trouble for cutting off.

To prevent the possibility of exposing a plate twice, place pieces of gum paper—stamp edging will do—over the end of the shutters on the dark slide, so that the act of drawing out the shutter will break the piece of paper. Or have a list of the plates in the slides with the numbers, and get into the habit of at once making a note against that number as soon as an exposure is made. I always do this myself, and find this list most useful when I come to develop the plate, for after a busy day's work it is quite impossible to remember all the different exposures, subject, &c. The less you trust to memory the better, at least that is my experience, and then if you change the plates in the slide during the day the plates themselves can be numbered in the corner, with an ordinary pencil, and so correspond with your list of notes.

As to the camera cloth, let it be large and have double strings at each corner, to tie on to the stand when needful, with a hole in one side for the lenses to pass through. I can remember great troubles in the past from the want of these same little strings on windy days.

The cap for the lens, I believe, should be altogether discarded now that a flap shutter and tube can be obtained so easily and cheaply. One feels so much more at liberty when using one of these shutters than when compelled to look after a cap; in fact, I feel always like a fish out of water if perchance I have from any cause to use a cap, and then the flap of the shutter acts as a good sky shade, better than holding one's hat over the lens which is so often done.

Use a little sleeve, open at both ends, to slip on to the lens, of some soft material, to prevent the light striking down into the lens through

the diaphragm slot, but sufficiently large to allow the easy introduction of the stops. You will not then have to keep, or rather try to keep, the focussing cloth over the opening in the lens.

I hope some of these hints may be of service to some beginners in our art, and that, therefore, they may be enabled to practice it with greater ease to themselves. I see I have written of photography as an art; well, I have always felt that the man who produces a picture of real artistic merit by means of photography has as much claim to the title of artist as one who puts a few different paints cleverly together—it is simply a different means to the same end.

A FULL-SIZE FINDER.

By F. A. Velasco.

Amateurs who delight in instantaneous photography, and particularly those who devote themselves specially to obtain pictures of yachts in motion, are not infrequently mortified, on development, to find they have only secured one half of the subject.

The difficulties of rapid focussing and centering are generally admitted, and although there are in the Stores a great variety of view-finders and meters, all are more or less inefficient, and leave much to be desired. At the present time several prominent amateurs are the possessors of two sets of exactly similar apparatus solely for the purpose of focussing and registering on the first the image to be secured in the second. I therefore propose to describe, and trust to render clear, without the aid of a diagram, how an ordinary bellows-body camera was converted into a 'twin' in a thoroughly practical and efficient manner with but a trifling increase of weight and bulk.

The arrangements are fairly simple. An additional front, the same height and breadth as the one on the camera, is fixed (as hereafter described) above, but in the same plane as the usual front, prolonging it upwards over the focussing screen and parallel with the front, is fitted a frame glazed with ground-glass of the same dimensions as that in the camera. The separation between the auxiliary front and screen should coincide exactly with those of the camera, and when ascertained, be carefully marked off on the top, and on either side of these marks two narrow strips of sheet brass are screwed three-sixteenths of an inch apart, the lower inner edges being undercut or bevelled; along the centre of the base of the temporary front and screen a single strip of brass, five-sixteenths of an inch wide, with a one-sixteenth of an inch bevel on the edges, is also screwed. If these strips, as described, have been correctly set, the single strip carrying the front, or the screen, may be pushed with slight force between the groove formed by the parallel strips, and will constitute a perfectly secure and ready means of attachment.

When in position, the front and screen are finally supported by two flat rigid brass bars, running from front to rear, and temporarily attached to the four corners by binding screws; the rods are slotted for one half of their length, to enable the instrument to be focussed without throwing the front and screen out of parallelism. A velvet focussing cloth is thrown over the rods and fastened securely by small studs, and

the twin camera is complete. A lens of the rapid symmetrical type is now fitted to the camera proper, and a cheap single-view lens of exactly equal focal length attached to the improvised finder.

The dry plate remains ready in the lower chamber with the slide drawn out, while the object is focussed and centered above. When taken apart the additional front and screen occupy about the same space as one double slide, while the only addition to the camera is the four attached strips of brass. The front of the camera in question was fitted with vertical and horizontal sliding motions connected by rods which worked the fronts in pairs.

This arrangement will often be found useful in general work when the vertical swing action to back is not required. To those cameras made with extending fronts clamped by means of rods and binding screws this method of attaching the auxiliary front would not be applicable. Suitable means of attachment, however, are so obvious that it need not occupy valuable space here.

DETAIL, DENSITY, AND CLEAR SHADOWS.

By A. Gil de Tejada.

The following method of developing has, during the last season, given me a far better quality of negative than any I had previously obtained with gelatine plates.

For holding the solutions, three dishes, at least, are absolutely required to secure the best results; and before proceeding to develop I prepare the following solutions, made up, of course, in any quantity:—

No. 1.

Plain pyrogallol	6 grains.
Water	1 ounce.

No. 2.

Potassic bromide	4 grains.
Citric acid	2 ,,
Water	1 ounce.

No. 3.

Liq. ammonia (·880)	1 minim.
Potassic bromide	½ grain.
Water	1 ounce.

Solution No. 1 is poured into a dish, the plate plunged therein and allowed to soak ten minutes, or even longer. While soaking, solution No. 2 is poured into another dish, and I then pour into a beaker or developing cup enough of solution No. 3 to fully cover the plate. After soaking the allotted time, the plate is withdrawn from the plain pyro solution and not closely drained; it is then placed in the third dish and the contents of the beaker swiftly and evenly poured over its surface. Whilst being gently rocked in the developing dish, the plate should now be carefully watched, and, as soon as *nearly* all the required detail is out, it is taken out of the solution No. 3, closely drained but not washed, and then plunged into the dish containing solution No. 2. Here it may remain

a minute or longer, according to the rapidity with which detail had appeared.

Whilst in this last solution a fresh developer is made up, consisting of

Pyrogallol	2 to 3 grains.
Liq. ammonia	1 minim.
Potassic bromide	½ grain.
Water	1 ounce.

Or, in fact, the ordinary developer; and after withdrawal of the plate from No. 2, and draining it, this fresh and strengthening developer is applied in the original developing dish. Here the plate is to remain until it has acquired all necessary detail (the first development was stopped somewhat short of full detail), gaining ample density at the same time.

Instead of solution No. 2 containing both potassic bromide and citric acid, it may contain the latter only; the resulting colour of the negative would then be colder and more like the wet-plate tone.

In the manner pointed out above, full detail and density may be obtained, together with as nearly perfect clearness in the deep shadows as is possible with gelatine.

SUGGESTIONS AS TO CHOOSING PRINTING PROCESSES TO SUIT PARTICULAR NEGATIVES.

By George Davison.

In attempting a picture with any particular effect by photography, the printing process to be adopted is an important factor to be considered.

The aim of the photographer is, it may be presumed, to discover that method of securing a positive which will give him the best result. Some would regard as best that which gave every gradation and detail existing in the negative, a delicious state of things never yet realised on any printing paper; others would disregard detail and appreciate a broad effect. It is impossible to state every case.

It may be accepted that the process which will best and most truly render the texture and quality of any material, and the feeling of any subject photographed, is the one most likely to find favour with the majority. It cannot be expected that any one process will be found to meet the demands of every class of negatives. This subject opens up a very wide field of discussion in regard to the artistic qualities of certain of the printing processes. In these few notes, however, it is proposed only to jot down some opinions gained from experience as to which of the printing papers is best to be selected for negatives varying in detail and density. Of all the printing papers alluded to here, that known as Alpha paper appears to give the best average result. It combines many of the characteristics of silver albumenised paper and of gelatino-bromide papers. Indeed, it is generally referred to as a chloro-bromide paper. With proper treatment it will give a fair print having passable contrast from a thin, over-exposed negative, and at the same time a good result from one that is dense and that errs on the side of hardness.

Ordinary silver albumenised paper will lend itself well to a negative of fair strength and good gradation, but is not extra useful for thin, flat negatives, nor for dense, hard ones.

The gelatino-chloride emulsion papers are very similar in behaviour, except that they render delicate detail in a thin negative extremely well.

Platinotype (probably the most sympathetic medium of all from an artistic point of view) seems to have very slight range, and to require its negatives to be full of gradation and rather vigorous; at least it is very rare that even a passable result can be obtained on platinotype from a negative having little contrast.

On the other hand, it is a very convenient fact for those who care to work more than one printing process that, with suitable development, bromide paper will give a marvellously good print from a negative which from its thinness may have been thrown on one side as useless.

Of course for those who work only one process—say, platinotype—it is possible to intensify thin negatives up to printing density; but it seems pretty generally agreed that the more one photographs the less one cares to intensify.

If there are any special characteristics similar to the above found with carbon printing, some one other than the present writer must speak of them.

A scientific explanation of the causes for the different printing papers having such specific characteristics (if the facts really are so) would be more in place in the Almanac, but this again must be left to a more competent hand to deal with.

RESTORING DAGUERREOTYPES.

By W. E. Debenham.

Although Daguerreotype has been now for many years an abandoned art, an old example of the process is still sometimes brought to the photographer for the purpose of being copied, or perhaps merely to be restored. Quite at the commencement of my photographic career, I remember having one the beauties of which were much obscured by that coppery film with which they are often found, after lapse of time, to become tarnished. The agent I then employed for removing this tarnish answered completely; and although since then I have seen another method, that with cyanide of potassium, recommended, I have continued to use my old plan, and as I have not seen it mentioned anywhere, it may be of some interest to record it.

The agent referred to is hydrochloric acid. This should be pure; especially there should be no nitric acid in it. A little poured upon the Daguerreotype clears away the tarnish as if by magic and leaves the image beautifully bright and pure. The acid is then washed off under a tap, and the plate finished with a little filtered distilled water. For the benefit of those who may not have had any experience in drying off Daguerreotypes, it may be well to add that this is accomplished by holding the plate with pliers over a Bunsen flame or a spirit lamp, and heating one corner rather more strongly than the rest. The plate is then raised vertically or nearly so with the hot corner at top, and blown upon so as to dry it rapidly, and without leaving tears or ridges to show markings as they dry off. Finally, the Daguerreotype should be sealed up airtight round *all* the edges of the plate and glass.

FERROUS OXALATE AND ALPHA PAPER.

By H. G. Moberly.

Modern printing processes have brought this developer so much into use, that it is worth while to describe a method of preparing and using it, which is almost perfection both as regards efficiency and simplicity.

Three stock solutions are required, namely, oxalate of potash, sulphate of iron, and bromide of ammonium.

A.—Take a good-sized bottle, half fill it with crystals of oxalate of potash, and then fill up with cold water. After standing for some hours and occasional shaking, test with blue litmus paper; if there is no change in colour add a few crystals of oxalic acid, sufficient when dissolved to turn the paper distinctly red.

B.—Take a smaller bottle, half fill it with crystals of sulphate of iron (which should be clean, not rusty), and fill up with cold water. After standing for some hours and occasional shaking, add drop by drop sufficient sulphuric acid to turn blue litmus paper distinctly red. Even with clean-looking crystals the solution is apt at first to be muddy, but the addition of sulphuric acid will render it clear and bright. If the crystals are not very pure more acid may be required than the litmus test would indicate.

C.—This is a ten per cent. solution of bromide of ammonium or potassium.

These stock solutions keep for any length of time, the only precaution in the case of B being to keep the bottle full and the solution distinctly acid. Now in the way these stock solutions are usually made, it is not easy to keep the bottle of iron solution always full. You do not care to be always measuring out so much water and weighing out so much sulphate of iron whenever you happen to use an ounce of solution. Yet you must either do this or resort to other preservatives, such as coal gas, to displace the air or oil to float on the surface. All these dodges are unnecessary. After using any of solutions A and B, fill up with cold water so long as there are sufficient crystals left to dissolve; whenever the crystals are running low, add more, from time to time testing with litmus paper and acidifying if required. In this way no weighing or measuring is required, and bottles A and B go on for an indefinite time, always full, always ready. Ordinary water is quite good enough. If it is hard some oxalate of lime will be formed in bottle A, giving the solution a milky appearance, but this will soon precipitate, leaving the solution clear. After some months frequent refilling a quantity of oxalate of lime and other solid impurities may have collected, in which case the bottle should be shaken up and the solution filtered back into it. If the developer produces an opalescence in the film due to the formation of oxalate of lime in the washing water, it may be easily removed by the use of a clearing solution composed of one part sulphuric acid to twenty parts of a saturated solution of alum. This alum solution may be prepared and renewed in the same way as solutions A and B. The clearing solution serves two other purposes, it hardens the film and removes any discolouration due to the iron.

A good normal developer for fully exposed plates or bromide prints may be made of six parts A, one part B, and five to ten drops of C to each ounce of B; but it may be as strong as four parts of A to one part

of B, and, on the other hand, it is possible to develop a plate with only a few drops of B to each ounce of A. In fact, contrary to what is usually stated, the variation and latitude allowable appear to me very great. But whatever the proportions are, do not attempt to economise the oxalate of potash by diluting the developer with water; it will only result in precipitating some of the iron as oxalate.

After using a developer there is no occasion to throw it away. Put it into a clear glass bottle, adding a crystal or two of tartaric acid, and leave it in the strongest day or sun light. It will recover much of its strength, and though it may be somewhat weak for negatives, it may be used to give density after detail has been got by fresh developer. But it is just the right thing for Alpha paper. With half a pint of old developer so treated I have developed fully sixty $7\frac{1}{2} \times 5$ prints on this paper, all as uniform as possible, though done in several batches in the course of eight or ten weeks, the developer being well sunned between each batch. I have also found that the toning bath recommended in THE BRITISH JOURNAL OF PHOTOGRAPHY of January 28, 1887, for Obernetter chloride paper, when exhausted for that purpose, answers admirably for the Alpha paper. The formula given is two grains chloride of gold, twenty grains sulphocyanide of ammonium, twenty grains phosphate (or acetate) of soda, and four ounces water. Used fresh this would be too strong for Alpha paper, but used as above, in conjunction with old developer, the range of tones obtainable is very great. This toning bath acts also as an intensifier, the final tone being a strong inky blue-black, which, however, is not very pleasing. By stopping the action while the print still shows some brown by transmitted light, the result after fixing is a colour very similar to a bromide print, but with more or less of a rich sepia brown in the shadows, which is very effective. So treated, Alpha paper will run bromide papers close.

HINTS ON ENLARGING FROM SMALL NEGATIVES.

By G. A. KENYON, M.B.

THOSE who find a difficulty in obtaining access to the direct light of the sky, or in putting up a reflector for the purpose of utilising the direct light of the sky in enlarging, may be glad to be reminded that tissue paper pinned upon an ordinary window is an efficient substitute.

The Welsbach light answers well for enlarging in place of the Argand lamp in the optical lantern—at any rate, when only a small portion of the incandescent mantle is employed, the rest being screened by a stop or otherwise.

The Eastman stripping film answers exceedingly well for making enlargements from, and its portability enables a great many subjects to be taken which otherwise could not be attempted. The facility of working in the field or at sea with the roller slide and a quarter-plate camera, particularly if the camera is of that light construction which working with a fixed focus allows (as in Shew's Eclipse hand apparatus), is everything that could be desired. The writer finds no difficulty in taking his apparatus thus arranged everywhere, whereas those working with even only half-plate cameras will be found to leave them behind or require extra porterage on mountain excursions. With the quarter-plate no

scruple is felt in asking the guide to carry it in addition to provisions, &c., whilst even the fixed focus camera can have a notch or two for focussing when near objects are being taken.

With reference to the keeping of solutions of sulphate of iron in good condition, a concentrated solution keeps well when acidified, but a weaker solution quickly alters. If the latter, however, have added to it bicarbonate of potash and citric acid in crystals, after placing in a soda-water syphon (cost 3*s.* about), it will keep perfectly and be a very handy form for measuring small quantities. A minute quantity of sheet zinc may be added if any doubt is felt as to the purity of the original compound.

ORDER.

By Buchanan Wollaston.

I think it is Pope who says that 'Order is heaven's first law,' and the necessity for the close observance of this law by our fellow-workers in the pursuit of photography, whether for pleasure or profit, is being daily brought more prominently to my notice either as professor, experimentalist, or preceptor, and I would fain throw out a few hints for the benefit of the brethren.

In my own practice I am careful to have a 'place for everything,' so that it is easy to place one's hand upon the right bottle, box, or plate in the yellow chamber, or literally in a dark room, the general order being as follows:—Upon the upper of three rows of shelves all stock solutions are kept, and a careful watch is kept upon the 'Winchesters' to see that these always contain enough and to spare. Upon the middle itself are handy-sized bottles with the various dilute solutions, replenished from time to time from the shelf above, and arranged in blocks, viz., block 1, pyro ammonia developer; block 2, pyro potash ditto; block 3, oxalate developer, and so forth. Upon the table-shelf only the dishes, &c., in actual use are allowed a place, the graduated measures being upon a bracket about the eye level. Dishes, large and small, being arranged according to their uses underneath the table. All bottles are distinctly labelled, and, as a further safeguard against mistake, they may be numbered with large, bold cut-out white paper numbers, varnished with common shellac varnish. In my workrooms the same system is adopted, varied merely to suit circumstances.

At the close of the day's work I see that a complete clearance is made and 'everything in its place.'

When experimenting, get rid of all but the actual solutions and apparatus required for the work in hand, take careful notes of failures and successes, and of the various idiosyncrasies of matters under examination.

The chaos which reigns supreme in most amateurs' dark rooms, often robs my pupils of a good deal of my valuable (?) time by having to clean up and arrange things before commencing actual work, but it is often very gratifying to notice the improvement which takes place in the quality of their work, and of the sense of satisfaction which follows the establishment of law and order.

In conclusion, let me impress upon all co-workers the necessity for

order in everything, and for the adoption of method and system, without which one's daily labour is misery, but with which one may say, 'I am contented with my situation, and happy, because I think myself so.'

CHANGING BOXES AND DEVELOPING EXPEDIENTS.

By William Tylar.

I do not know how many photographers employ changing boxes and bags, but I presume, from the number advertised, large and small, simple and complicated, these must be numerous. Why they use them I can hardly imagine. I have seen men carrying a changing box three or four pounds weight who would grumble at carrying two pounds in the form of dark slides, but as several have them, I will endeavour to give them a few hints which will make them much easier to use.

First, bind your plates back to back with cards between them so that they are always in pairs in the right position for placing in the slide (this is easily done by using the old-fashioned 'preserver,' so much used in the old times of collodion positives, and which can be still had from the dealers at less than 1*d.* each). This saves all the disappointment of finding you had plates wrong side down, and, consequently, reversed images.

The sleeves are, again, a source of trouble, as light is apt to find its way in. To avoid this sew an extra band of elastic round the sleeve about three inches from the mouth. You then have a double grip round the wrist, and all possibility of light getting in through the sleeves is prevented. Have sleeves long enough so that your hands can easily reach every corner of the box or bag.

Pack exposed plates in a tin box; unexposed ones in a cardboard box. A piece of soft sponge placed in the box will prevent all shaking, and not dust or injure the films. Where the slide is inserted through a lid fix two elastic bands to the lid to make it self closing, and another evil is overcome.

Now how best to do without the changing boxes and at the same time change your plates, have very little weight to carry, and the inconvenience of another parcel done away with. It may surprise some of you when I tell you your whole developing kit need not weigh a quarter of a pound if you use your brains. It can be carried in your pocket; can be mixed and used at your lodgings; no bottles to get broken; you can measure your liquid and need not carry a measure; you can carry an effective lamp which need not weigh half an ounce; and can profitably fill up your rainy days or long evenings when you can find nowhere to go and nothing else to do; and thus make your tour pleasanter, less expensive, as plates will not be wasted from errors in exposure, and you also get the work done before going home. I dislike groping about in the dark myself, and I set to work to overcome the difficulty, and now either change my plates at night in the room, or get some kind old dame to grant me permission to go down the cellar. This they will generally do, unless they have a stock of beer below; and as a glass is an essential part of my apparatus, it certainly has a rather suspicious look to knock at a stranger's door, ask the loan of a glass, and permission to go in the cellar. They may think you a bit gone in the upper storey at first, but

an explanation of your object, and a few coppers to the children, will always secure you the necessary privilege.

The cellar and tumbler secured, the next job is to make your lamp. I carry with me a small piece of candle about two inches long—the hard white wax is the correct thing—I take a penny from my pocket, light a match, warm one end of the candle, stick this to the penny, and the candle now stands upright; drop this in the borrowed glass. All you have now to do is to wrap round the glass a double thickness of golden fabric (*i. e.*, cloth, not paper) about 15 × 12 inches, and you have a light which is perfectly safe, and plenty of it, sufficient to enable you to read a newspaper two yards off. You can see what you are doing, and thus avoid mistakes. The light escaping from the top never affects me, as I always keep the dish covered during development. I do not think there would be any harm accrue from it, however, as reflected light is very feeble. If, however, a piece of yellow tissue paper is pinned on the ceiling over the lamp, all will be quite safe.

For developing, I use waterproof paper trays, and my developer I mix as I want it. Get an ounce of soda from the nearest grocer's shop, dissolve in ten ounces (about half a pint) of hot water, and let it cool. When cool, for each quarter-plate take two tablespoonfuls of above. You have then one ounce measured out. Dissolve in this one grain of bromide of ammonia, which you have ready weighed up in papers before starting, and add as much pyrogallic acid as will stand on an ordinary round bone mustard spoon. You have then a developer which is reliable in use, gives good density, and clear, crisp negatives, together with the further advantage of being getable anywhere. For exact exposures this developer is, I believe, unsurpassed; and by following the lines I have pointed out you will get exact exposures.

If negatives are well washed after development and dried they will keep indefinitely, and can be fixed on reaching home, but it is best to keep them in the dark. I find white tissue paper well dried before the fire as good as anything to pack plates with. Metal grooved boxes are an abomination and a snare for packing plates in, unless great precautions are taken to prevent any movement of the plates themselves. In mounting prints, especially to amateurs, there is often a difficulty of getting a nice smooth mount. If, however, the paste or starch is put in a fine linen bag of two or three folds thickness and squeezed through the pores, the material is very finely and evenly sub-divided, and half the difficulty is over, and the addition of five drops of oil of cloves to the cup of paste will make it keep for several weeks in a fit condition for use. Always smooth the print down with a wet cloth or a piece of white blotting-paper. I daresay the above will sound a little childish to 'old hands,' but they are old enough and knowing enough to take care of themselves, and I hope they will remember the immense number of beginners who are always glad of a little information of practical utility.

WHEN THE SUN GOES DOWN.

By George Mason.

Since writing up the magnesium ribbon experiments that appeared in the Almanac of last year, I had the diamond lamp made (see Almanac of last year for description), but am sorry to say, till now, it has not proved

successful. I cannot get the four strands to work simultaneously, the clockwork arrangement being at fault. I am still working at it. Since then, however, a new illuminant has been introduced in which magnesium powder is the chief factor.

The following is the composition used, and it gives fully exposed pictures in a flash :—

Magnesium powder	20 parts.
Chloride of potash	10 ,,
Sulphide of antimony	10 ,,

The chloride of potash is first pulverised in a suitable mortar, the magnesium powder and antimony are then added, mixing them well together with a wooden or horn spoon. A very small quantity of this powder will be found sufficient to light a single figure. I have seen a bust picture fully exposed where the light used was produced from one drachm of the powder.

I have also seen a group of eighteen persons taken in an ordinary room by Dr. Workman, where all the shadows were fully up, and only two drachms of the powder was used in the production. In this latter case, however, the powder was formed in a train about seven to nine inches long, and consequently took longer to burn. Any red fire such as touch paper, or vesuvian, will do for igniting the powder.

The smoke trouble attends this new light, the same as any light produced from similar compounds, but Mr. Greis, of Glasgow, who now works it with great success, uses the following means for keeping his studio free from the smoke :—

He burns the powder in a wooden case with a glass front. The box will be about eight inches deep with a glass front surface of 24 × 18, which stands on a table. This case is fitted on top with a chimney to retain the smoke. When the exposure is made it is immediately removed and a fresh one placed ready for the next exposure, the other one being cleared out in the meantime. Thus the studio is kept quite free from smoke.

To-day I have received a copy of the *Sun* from Mr. John Carbutt, Wayne, in which some successful experiments are noted, the pictures being produced by another new light for night photography. In this case the powdered magnesium is spread over a small piece of gun cotton. Home groups have been taken very successfully with this compound. Mr. Carbutt says he touches the gun cotton with a lighted match, then there is a bright flash, just a slight cloud of smoke, and that is all. The light flashes up and goes out so quickly that the people in the picture don't have time enough to move before it is all over. Working on the lines of the above notes, experimenters will be able to obtain good results, either helping the light in a dingy room or enabling them to work on when the sun goes down.

COATING AND DEVELOPING ROOMS.

By Ellerslie Wallace (Philadelphia).

It will no doubt be reiterating old and even worn-out advice to say, 'Have plenty of light in the dark room.' I can imagine that even an experienced photographer would have been surprised at seeing what has recently come under my notice in some photographic establishments in this city. In

the first place, on visiting the factory of my friend, Mr. John Carbutt, who makes the celebrated Keystone plates, I noticed that the lighting (and ventilation) of the coating room was of the most perfect character, theoretically and practically. That is to say, every precaution was taken to expose the gelatino-bromide emulsion to *as little light as possible*, and that of a deep ruby-orange shade.

On the other hand, I have seen the most sensitive negative paper developed in a light in which I would have feared to risk wet collodion. Gelatine plates of high sensitiveness were constantly being developed also in this same light. The medium was simply orange-yellow paper pasted over the window. The developer being pyro, and very free from colour, could hardly act as a protector, at least in the sense that ferrous oxalate would. It seems, then, that it is rather the *time* during which the film is exposed to the dark room light that would cause fog, if such appeared. Now as modern photography demands two kinds of dark rooms —the coating and the developing rooms—I feel that I can safely counsel all who do not coat their own plates to have plenty of good, safe, deep, orange-yellow light in the dark room.

THE LIGHT FROM KEROSENE LAMPS.

By Alex. I. Simpson (Lismore, N.S. Wales).

Some time since I read in a technical journal a report of a series of trials of the comparative photogenic value of various forms of burners as supplied with most of the kerosene oil lamps now commercially obtainable. My interest in the subject arose mainly from a desire to find out what form of lamp would give the best light when used with the projecting lantern, a subject which has always had a peculiar attraction for me. Now that the kerosene oil lamp, with the necessary fuel, has become such an universal illuminator, so easily and cheaply procurable, and its use and properties so generally understood, it is evident that it is much the most ready and convenient means of illuminating pictures upon the screen; hence my anxiety to obtain some hints respecting the various quantities and qualities of light yielded by the respective lamps in the trials referred to.

At the outset, the report showed that the examination had been, to all appearances, carefully conducted; several times repeated and accurately noted, the individual results, as well as the means, being properly tabulated. It was, therefore, with considerable surprise that I found the result of the experimentalist's labours so different from that of my own observation and experience. This naturally set me thinking, and I again referred to the article in question, when I came to the conclusion that either in the report, or the series of experiments, so many matters of detail affecting the result had been omitted, that it was practically useless as a contribution towards solving the question of the most perfect and scientific method of burning kerosene (or any other illuminating oil) in order to obtain the greatest illuminating power and most perfect combustion.

Recent improvements in the forms of the burners, and the manner of supplying air to them, and other details, have rendered the illuminating power of the oil-fed flame very much greater than it was a few years ago

with the old appliances, but for the purpose of using in a lantern, the flame requires a considerable amount of condensation. My own preference has been hitherto for some form or modification of the Silber light, with the circular wick and metal cone. With one of these I have replaced the Argand lamp usually supplied, and got rid of the accompanying mess from the thick oil, and at the same time of smoking chimneys, and the difficulty in regulating the flame; for I found that very often when I had fixed the light so as to burn perfectly and then closed the door of the lantern, upon looking into it a few minutes later the flame was streaming out of the top of the chimney, which was being badly smoked, necessitating turning out the light and wiping the chimney when it had become cool enough for that operation.

Returning to the ordinary burning arrangements, I have found the following points (amongst others, perhaps) require careful consideration and attention:—

First.—A good pure white *oil* is an absolute necessity. A bad oil will soon obscure any chimney, although you may render the combustion so perfect that the flame burns white.

Secondly.—The *wick* should be of good porous texture of pretty large dimensions, clean, and evenly trimmed, and turned up until the flame is at its best; I have, however, seen the size and illuminating power of the flame vary very much with the same wick by varying the burner or the chimney, or both.

Thirdly.—The *chimney* or globe must be of good clear glass of a suitable length and aperture. This point can only be determined by experiment, as it is controlled to some extent by the construction of the burner. If the chimney is wide at the mouth and short, as a rule the flame will be yellow and smoky, while, on the other hand, if it be too long and very narrow at the top, the flame will be white but small, and its illuminating power diminished. The *shape* of the chimney also affects the *form* of the flame which spreads, fan-like, in one with flattened sides, while it becomes long and cylindrical in a chimney of corresponding shape. Generally the best results are obtained from a rather long chimney.

Fourthly.—The *burner* should be carefully constructed, as upon its form and principle of action depends to a very great extent the quality and power of light yielded. All burners that I have yet met with are constructed upon one uniform principle, that of causing the air to impinge upon the flame or flames by means of a cone or cap, or some modification thereof, the wick being held in a tube either flat or cylindrical, and varying in number. In some lamps the chimney being contracted, itself forms the required cone, but more commonly this is of metal, and this portion of the burner very much influences the flame. The form of the aperture, its size, and its position above the wick tube, all require careful attention. If the opening for the flame be too small the ascending current of air is brought together in such a way as to diminish the size of the flame; if it be not accurately adjusted over the end of the wick tube, the flame will be driven to one side and impinge upon the chimney, smoking it; while if it be too large the air current will not be properly brought into contact with the flame. The edges of the opening, also, should be smooth and uniform.

The *tube* should be as large as the burner will admit of (and the wick,

of course, should correspond); the length of the tube in relation to the cone is of importance. I had a lamp shown to me, from which the owner could not obtain a satisfactory light; after watching it burn for a few minutes and turning the wick up and down, experimentally, I took the burner and cut off nearly a quarter of an inch from the tube with a small file. Upon relighting the lamp the combustion was very good indeed, showing that the air current had been brought to bear upon the flame at a point too near the wick previous to the tube being shortened.

Finally.—The *supply of air* to the flame and mode of admission is of much importance. It should be ample, but should come up beneath the cap or cone, or through the tube (in cylindrical burners), and it should not get access from beneath the chimney (though imperfectly fitting the burner); it should also be regulated by the construction of the lower part of the burner in such a way as to prevent an unequal and unsteady supply, making the flame flicker and burn unsteadily.

The foregoing remarks are merely the result of my own observations in the use of various forms of lamps, and probably do not exhaust all the points which require to be noted and attended to. Attention to them is, however, necessary to secure the best results from existing appliances, so far as I have seen; and in making any comparative tests or experiments, they all require to be taken into consideration, otherwise the deductions will be incorrect. I hope some one will give us a definite and reliable formula for the construction of a good kerosene oil burning lamp suitable for the lantern.

PRINTING ON WOOD BLOCKS.

By W. T. Wilkinson.

In one ounce of water dissolve ten grains of chloride of ammonium, then add the white of one egg, stir well together (but do not beat up), then add sufficient zinc, white, to make a thickish paste; now take the wood block and free it from grease by rubbing over with a soft rag dipped in spirits of wine; then spread the above paste over the block with the fingers as thin as is possible consistent with covering the surface; polish with the lower part of the palm of the hand; now stand the block on end to dry.

When dry, sensitise by just dipping the surface into a sixty-grain solution of nitrate of silver for two minutes; do not let the block dip too deep into this solution, in fact, if care be taken the wood will not touch the silver solution at all. For a beginner the best plan is to smear the sides of the block with tallow, which will protect the wood. At the end of two minutes blot off very lightly with clean, smooth filter paper, and again stand up to dry on end; now expose under the negative (which, of course, is a reversed one) until all the details are well out; then fix by just dipping the surface in a weak solution of hypo; then blot off the hypo, and rapidly wash away the hypo by blowing a stream of water out of a bottle; then blot off again, and rinse with methylated spirit, and stand up to dry on end again.

This process is simple, certain, and safe. Be sure to keep water from getting a chance of soaking into the wood, and always stand up on end to dry.

MERCURIAL INTENSIFICATION.

By A. P. Higgins.

Intensifying is not now so common as it was in the wet collodion days, but occasion does sometimes arise in which a negative is not sufficiently dense to give a satisfactory print, and on such an occasion a simple and reliable method of intensification will be found of great advantage.

An intensifier to be perfect should possess, at least, the following qualifications :—

(*a.*) It should be cheap and easy of application. (*b.*) Should not clog up nor stain the shadows. (*c.*) Should not require prolonged washing between each stage. (*d.*) Should be permanent. (*e.*) Negatives treated with it should be easily reducible if necessary. (*f.*) The operation should be capable of being repeated until sufficient density is obtained.

All these advantages, and more, are possessed by the sodium sulphite intensifier. The best mode of proceeding is as follows :—

The negative after having remained in the fixing solution for ten minutes after it appeared to be fixed, is soaked for a further ten minutes in a saturated solution of common alum, and then washed for a quarter of an hour.

When washed, place in—

Saturated solution of bichloride of mercury ...... 20 ounces,
Hydrochloric acid (strongest pure).................. ½ drachm,

until sufficiently bleached, and after five minutes washing under the tap immerse in a strong solution of sodium sulphite until the film is black on both sides, then *immediately* plunge it into cold water and allow it to wash for a further quarter of an hour when, if sufficiently dense, the operation will be over and the image of a beautiful neutral black tint, with perfectly clean transparent shadows. However, should the negative not be sufficiently dense the operations of bleaching and blackening may be repeated until the required opacity is obtained.

It is very important that the action of the sodium sulphite should be arrested the moment it has completed its work, as if the negative is allowed to remain in the solution after it has gained its maximum density it will be reduced again to its original, or less than its original, density. Any over intensified negative may be reduced by immersion in a solution of sodium sulphite.

This property of reduction as well as intensification which is possessed by sodium sulphite is of great advantage in the case of over exposed, and consequently thin, veiled, and slightly foggy negatives, as, if after removing the plate from the solution as soon as the blackness has penetrated to the back of the film the action is allowed to continue, the negative can be reduced until the shadows become clear and lose their slightly foggy appearance. Intensification may then be proceeded with until printing density is obtained.

(Sodium sulphite is now so well known that I need scarcely say that it is *not* the same as the hyposulphite which we use in fixing. Its average price is 6*d.* per pound.)

Nothing new is claimed for this process ; but as it embraces so many advantages, and its capabilities appear to be so little understood and appreciated, I have selected it as my contribution to the Almanac with the hope that it may prove as useful to others as it has to myself.

DEVELOPING GLOVES.

By S. Herbert Fry.

The black art! And I hear people talk as if the days of stained and dirty fingers were past, and such things as grimy finger-nails and roughened and coarse hands all gone and clean swept away by the advent of gelatine. I fancy that pyrogallic leaves more 'colour' in the skin than a good strong cleaning bath will take out, and oxalate used within measurable distance of the aforesaid makes a combination ink which requires to be worn, not washed, off. But I do not propose to offer a remedy for this acknowledged state of things, but an easy method of prevention other than the forlorn hope of not putting one's fingers in the solution.

Now, firstly, buy a pair of dogskin, or Cape, or coachman's, gloves, say one good size too large for you. Don't economise by using an old pair; they soon go to pieces and let in water. Secondly, dissolve some indiarubber in benzole, or buy some already dissolved; any photographic chemist keeps it. Put on the gloves and pour a little of the rubber solution into the palm of your glove, and soak the fingers of both gloves and rub the indiarubber in well, exactly as if you were washing them.

Put the gloves away for half an hour and repeat the operation. For all practical purposes the gloves will be found to be waterproof. At any rate, they won't allow the developer stain to come through, and, as they are too large for you, they can easily be pulled on and off. This is especially necessary for handling plates and getting them out of slides previous to development. An occasional application of the indiarubber solution before use will keep the gloves in good order.

A good point about the gloves is that they don't make one's hands so clammy as solid rubber, and never tear, like those expensive articles.

I do not recommend the gloves more on account of their cleanliness than that they protect the fingers from the roughening caused by contact with developing solution, and at the same time give freedom of action.

REGULAR TONES WITH ALPHA PAPER.

By J. J. Acworth, F.I.C., F.C.S.

Those who have worked with Britannia 'Alpha' paper often complain that uniformity of tone is a thing devoutly wished for, but too frequently not attained. Lately I have been making some experiments with this interesting paper, and I must confess I cannot always succeed in getting regular tones by following out the directions given for working the paper. As a result of some experiments, I have adopted a *modus operandi* of my own for securing greater uniformity of tone, and this may be of some value to others who, like myself, so admire this paper from the fact of the range of tone which the resultant print is capable of attaining; for the permanent nature of the result, and also, and not least, the knowledge that brilliant prints from weak negatives can be obtained on this paper equal to and superior to albumen ones, when prints on the latter would not be worth having.

The first thing of importance is necessarily the exposure. As is well known, warm tones require a long exposure and cold tones a short one.

I have tried many experiments with daylight as the illuminant, and have made many excellent specimens by this method; but daylight is always a variable quantity, and may be almost said never to be twice alike as far as photography is concerned, so that I have finally, though somewhat reluctantly, been forced to give it up for gas of good illuminating power. Lately I have worked with the albo-carbon light, and consider this an all-round good illuminant for the purpose. I may add that I also use a screen of white paper behind the burner, which adds considerably to the value of the light. Supposing the negative to be of ordinary density, and the tone to be that similar to warm albumen prints, I find about one minute at about six inches from the flame will be about sufficient exposure. The development is a delicate operation certainly, and requires some skill to know at what stage to stop. All details must be thoroughly and readily brought out, and the print must have a slightly overdone appearance before being taken out of the developer. The tone should be a pinkish chocolate with a blackish bloom just appearing in the shadows, otherwise the image will vanish considerably in the subsequent operations. Supposing this point nicely hit, the print is placed in alum and acid (the acid is best left out in hot weather) for a longer or shorter time, according as the prints are more or less developed. The print should be freely moved about so as to enable the solution to act equally. This bath takes down, to some extent, the intensity of the print; in fact, it acts somewhat as a reducer. This and subsequent operations can be done in gaslight and daylight. When the intensity is what I consider about right (still with a somewhat over-exposed appearance) I wash the prints in several changes of water, and place them direct in the hypo solution for a few minutes, and afterwards wash thoroughly for thirty minutes to one hour. They are now of a yellow or rather yellow-brown tone, and slightly weaker in intensity than would be desired in the resultant prints. They have now to be toned. The toning bath which I find gives excellent results is the following:—

Gold chloride	1 grain.
Calcium chloride crystal	10 grains.
Water	12–15 ounces.

The bath should be made up with warm water and used when cold.

I find that two to five minutes in this bath is sufficient to tone the prints. This operation can be best done in daylight, and the tone judged both by looking at and through the prints. After toning they should again be washed. I may mention that prints always look a colder tone when dry than when wet.

HALF-TONE BLOCKS FOR TYPE PRINTING.

By W. T. Wilkinson.

Procure a proof from a copperplate ruled with fine lines, about one hundred to the inch, the ruling to be either single or crossed lines.

The size of this sheet should not be less than 18 × 15 inches, larger by preference.

The proof should be upon fine matt enamel paper, and must be perfect.

The proof should be mounted either upon a stretcher or upon thick, smooth millboard, and should be taken the greatest care of.

From this proof take various-sized negatives on wet collodion plates.

Do not waste time and money by trying gelatine, as they are quite useless for the purpose.

For these negatives (called screens) the collodion must be old and ripe, the bath new and in first-class condition. Use patent plate-glass plates as thin as possible, and quite free from scratches or striæ, and albumenise them. These screens must be perfectly sharp all over, and to ensure this paste some slips of good bold type letters at each corner, outside ruling on sheet, to focus by.

These screens must be perfectly clean, free from all markings, spots, or comets, and must show the lines clear glass.

Varnish the screens with perfectly clean amber or benzole varnish.

The screens being obtained, place the photograph or washed drawing that it is intended to reproduce, and, having focussed to size required, sensitise a wet collodion plate, then select a suitable screen and fix it in dark slide underneath the silver-wire corners that are to carry the sensitive plate; then, after well draining the plate, place it in carrier and expose in the camera.

Now, as the image projected by the lens before falling upon the sensitive plate has to pass through the screen, the lines on screen breaks up the half tone, and the result is upon development a grained or divided negative. This grained negative is developed in the usual way, and after drying is varnished with water varnish or benzole varnish.

The transfer to zinc is best made by printing in bitumen, purified by means of five or six washings in common methylated ether, the residue dried and then dissolved in pure benzole, in the proportion of about half an ounce to twenty ounces of benzole, or in such proportions as will give a very thin golden film on the zinc.

The zinc plate must be very highly polished, placed in the jaws of a whirler, dusted with a clean brush, and sufficient of the bitumen solution poured on as is judged will cover the zinc; now set the whirler spinning for about a minute, when the film of bitumen will be quite dry and ready for exposure.

Expose under the grained negative for about twenty minutes in the sun or three hours in the shade; then develop by immersion in a tin dish containing turpentine, keeping the dish rocking until all the soluble bitumen is removed; then wash under the tap and rub gently with a pad of cotton wool, which, if the exposure has not been sufficient, will remove the image, but if sufficiently exposed will not harm it. In the latter case at once immerse the plate in a mixture of nitric acid quarter ounce, water, one pint; and a small pinch of alum. This will at once attack the unprotected zinc, and enable the operator to see if all the lines are intact and if all the half tones are developed out. If not, immerse again in the turpentine (after washing away the acid) and rock until development is complete. After again washing and immersing in the acid wash well, blot off with clean blotting-paper, and dry spontaneously—not by heat.

When dry, smear over with thick gum, fan dry, then with a fine leather roller charged with thick ink roll up the plate until the whole of the bitumen forming the image has taken as mnch ink as it will; now etch in a bath of nitric acid and water, the acid being just perceptible to the taste—say, one ounce of acid to one hundred of water. Keep the dish rocking for five minutes, then wash dry, smear with gum, fan gum dry, and after damping roll up again with leather roller, which will

cover up some of the half tones; then again etch for ten minutes after strengthening acid bath with a few drops of nitric acic; then repeat the operations of washing, gumming, rolling up, and etching for two or three times more, according to the subject in hand; then clear off the resist and get a proof pulled, and if any portions of the image would be improved by further etching roll up with leather roller, stop out those portions that do not require etching, then etch for from five to ten minutes.

These operations are all easy, and to an intelligent operator success is certain, provided that, first of all, a proper ruled sheet is provided, and from this good clean screens are made; that the zinc plate is thoroughly well polished; that purified bitumen be used, the film very thin; and, above all, *that a whirler be used*, coating wlthout the whirler being almost useless, as the film will be too thick at one end and too thin at the other, the consequence being the thin end will be overprinted and the thick end under.

SKIES IN ENLARGEMENTS.

By Chas. A. Parker.

Supposing that a negative intended for enlargement has been taken on a perfectly clear day it will be spoilt in a great degree by the large expanse of sky, which would not appear so noticeable in a small print, but renders a large picture very inartistic; a simple way of producing cloud effects may therefore prove useful to some of the readers of the Almanac.

First procure a suitable sky negative of the same dimensions as the one to be enlarged from (I presuppose that the operator is acquainted with the method of obtaining a sky negative), then carefully pencil on a piece of black paper the exact outline of the trees or housetops in the negative. Having cut out this mask of the lower portion of the picture, lightly gum it on to the plain side of the sky negative so as to effectually block out all portions except those clouds that it is wished should appear in the enlargement. The sky negative having been thus prepared, place it in the carrier and expose (for example) say thirty seconds, then place the cap on the lens, remove the sky negative from the carrier and replace by the proper negative, exposing this five times as long, the development and subsequent operations being precisely the same as usual. If this has been well done it will be found a great improvement, and by giving the sky one-fifth the exposure of the negative it will have a beautiful soft appearance. Should there be some small object such as a flagmast or a weathercock (as indicated in the above sketch), there will be no need to cut it out, as it will be certain to print darker than the surrounding clouds.

AIDS TO PHOTO-MICROSCOPY.

By J. J. Briginshaw.

There are not wanting signs that photo-microscopy is beginning to receive the attention it justly deserves. Whether considered as a pastime or a scientific research, it yields to no single branch of photography in the fascinating nature of its application or the usefulness of its results. The pleasure and enjoyment derived from the comparative ease with

which a photograph of the image of an enlarged microscopic object is obtained with the low powers, naturally and irresistibly leads the student to attempt the higher branches. It is here the real trial of patience commences, and the skill of the operator taxed to its utmost limit.

With the camera and microscope connected satisfactory illumination of the object on the screen is an exceedingly tedious operation, even with the best and most perfect optical accessories. Several methods are employed by individual workers to meet this difficulty, and some interesting articles have appeared in the journals and ALMANAC on the subject, notably from Dr. Maddox and 'Procella.' The latter writer publishes his plan of getting over the difficulty. The microscope and lamp are mounted on a separate short baseboard, which is lifted off the long baseboard each time a fresh object is to be photographed, for the purposes of finding and arranging it. The illumination having been satisfactorily arranged, the board, with the microscope, lamp, and condenser, is returned to its place, and connected with the camera. This is so far satisfactory, inasmuch as it accomplishes the object aimed at; but it must be admitted that the risk of lifting a heavy microscope and amp from one table to another each time a change of object is required is certainly great, and one which the owner of a costly instrument might hesitate to use. This is avoided by a plan I have adopted, after many trials of various methods that the necessity of the case suggested. It consists of a swinging tail-piece attached to the baseboard. This tail-piece carrying the microscope, condenser, and lamp, is supported by a ball and socket castor, and is attached to the fixed baseboard by a central pin, which allows it to swing round until it is at right angles to the rest of the apparatus. By this means the eye-piece end of the microscope is brought opposite to the operator, and is in a convenient position for manipulation. The microscope is still kept at the horizontal position. The object having been adjusted and the best illumination obtained, the microscope, condenser, and lamp are swung back to their original position, and the collar of the camera connected with the microscope tube, a slight adjustment of focus being all that is further necessary. It will be seen that this arrangement is not by any means a complicated one, and any existing baseboard can be easily altered. In my case the work was carried out by a local carpenter, from instructions I gave him.

For the guidance of those just taking up the higher powers I may add a few simple directions, failures often being traced as the result of an insufficient attention to details, more especially in connexion with the lighting of the object. An achromatic condenser is indispensable. Every care should be taken that it is accurately centred in the substage. This is important, and should be done before placing the object on the stage. It is easily accomplished with a low-power objective and micrometer lines marked on the condenser for that purpose. Now fix the slide on the stage, and with the same low-power objective arrange the object and bring it to the centre of the field, a position it should still be found to occupy in substituting a high power. A series of diaphragms is supplied with some forms of the sub-stage condenser. These give increased facility and power for lighting the object, the direction of the rays being entirely under control. The student is advised to contrast the several ways of illumination and to make himself thoroughly familiar with the different effects that can be obtained by the use of these dia-

phragms. Their manipulation, however, will require some little practice. In cases where the light requires to be modified, the iris diaphragm, an excellent contrivance, can be used very effectively. The form of lighting having been decided upon, the position of the achromatic condenser will have to be fixed by racking the sub-stage in and out until the best illumination is arrived at. If greater intensity of light is required it can be obtained by using the ordinary bull's-eye condenser between the lamp and sub-stage, with its flat surface towards the lamp, in addition to the achromatic condenser.

In choosing objectives, the homogeneous immersion lenses have high claims; they admit a large amount of light—no mean merit with the screen some four or five feet away—and they are not difficult to work. A couple of yellow and blue glass discs fitted into the sub-stage are useful accessories, and certainly have advantages used under certain conditions, either alone or in conjunction with isochromatic plates.

Having regard to all that has been written, I have in no way attempted to deal exhaustively with the subject, and, as will be inferred, my remarks have been mainly directed for the benefit of the photographer attracted to microscopic work rather than to the experienced microscopist. The few suggestions, however, that I have made I trust may be found of some use in pursuing a branch of photography at once absorbingly interesting, but in which success is frequently only arrived at through many failures.

SPOTS ON NEGATIVES.

By A. E. Dean.

Many persons who develop negatives by means of ferrous oxalate complain of transparent spots in the negative. This is almost invariably the case when the negative is immersed in the developing solution directly it is taken out of the slide. It arises from innumerable air bubbles caused by the solution not taking kindly to the whole surface of the plate.

It may be entirely avoided, either by the application of a tuft of cotton wool to the surface of the plate immediately after it is immersed, or by wetting the gelatine surface of the plate with plain water before transferring it to the developing dish. Some plates have a surface very repellent of water, and to these the air bubbles will adhere tenaciously, requiring smart friction to dislodge them.

TRAY ROCKERS.

By W. Irving Adams (New York).

Where an oscillating motion is required for a tray or dish—and such is often desirable in a case involving protracted development—the great value of a heavy pendulum which may be set vibrating by a push of the foot does not appear to be adequately appreciated. Elaborated contrivances to effect this end by means of clockwork have been made, but so far as I can see photographers do not appear to have taken kindly to them, perhaps on account of their expense.

For the benefit of those who desire to make a tray rocker, upon which

a tray with its contents, whether glass or paper, may be kept in motion for a prolonged period without attention, the following description is written:—

The pendulum consists of a simple rod of wire scarcely so thick as a common pencil; its length may be from forty to sixty inches. To the lower end is fixed a heavy cast iron weight, the heavier the better, the upper end terminating in a hook, the end of which is bent back upon itself so as to project for about an inch at a right angle to the rod and nearly level with the top of the hook. Cut a hole in the worktable of sufficient dimensions to permit of the hooked end of the pendulum being passed up through it, and then insert through the hook a triangular bit of steel, such as a piece two inches in length broken from a small file of the class used for sharpening saws, which after being softened by heat must have one edge filed or ground smooth, although not absolutely sharp. A pendulum suspended in this way will after being started in motion continue to vibrate for nearly an hour; this, however, depends upon the weight of the bob.

One end of the tray must rest upon the projection from the hook, and the other on a slab of wood of such a height as to make the tray level. If the tray be half filled with water, and an impulse be given to the pendulum, it will flow backwards and forwards for a long time, thus facilitating developing, washing, or any like operation.

THE NEW MAGNESIUM FLASH LIGHT.

By F. C. Beach (New York).

The use of the magnesium light as an aid in lighting poorly illuminated subjects, and in furnishing the only means of illumination in taking photographic pictures at night, is now well known. It is said to rank next to sunlight in its actinic effect on the sensitive plate. Heretofore, magnesium has generally been burned in the form of a ribbon, which was slow, and necessitated an exposure, when using an open lens, of from ten to fifteen seconds.

When used in the form of a powder mixed with sand, the latter falling from a funnel through a horizontal flame of an alcohol lamp, a more rapid but imperfect combustion takes place. Quite recently Dr. H. G. Piffard, of the Society of Amateur Photographers of New York, experimenting in the line of explosive illuminating compounds, accidentally discovered the use of guncotton as a simple, safe, and sure medium for the firing of magnesium powder. Now that the magnesium powder can be so cheaply obtained, we may expect that large quantities will be consumed in producing the effective flash light. Guncotton, costing about the same as magnesium powder, greatly reduces the total expense of the light; furthermore, it is readily obtainable from any photographic supply house.

My method of working has been to take enough negative cotton to cover a disc about two and a half inches in diameter, and pull the fibres apart so that it may have an even thickness, and allow the air to get freely at it. Next, on this part of cotton I sprinkle enough magnesium powder to cover it nicely—in fact, to nearly conceal the cotton. The powder should form quite a thin film. This done, it is ready to flash off. I put the prepared pad on a dustpan, and set the latter on the upper step of a step ladder, a little to one side of the camera, so that the light will have a slight

angle downward. It should not be further from the object than ten feet. After focussing and locating the sitter, the lights are turned down, the lens cap removed (the largest diaphragm being in the lens), and the exposure made by simply lighting the wad of cotton with a match. The resulting flash, lasting, perhaps, half a second, is of great brilliancy and has a high actinic force, yet it is so short that it seems incredible that the reflected light from the object should act upon the plate sufficiently. But experiment proves that it does, and has, of course, a better effect on a plate of a high degree of sensitiveness than on a slower grade. The exposure is so rapid that persons moving slowly about a room, or in the act of laughing, will be caught perfectly sharp.

It will be seen that the possibilities of this compound, giving off as it does at least five times as much light with a corresponding less degree of smoke than the old magnesium ribbon, will be very great, and be of material assistance to the amateur and professional photographer. In taking dark interiors, where a small stop is necessary to obtain sharpness, the effect of the light can be had by making several successive flashes.

Undoubtedly, a new article for photographer's use will now be invented, such as a guncotton cartridge having the magnesium powder already mixed in with it in the proper proportion. Then the photographer will only need to take out the cartridge from its box, set it on a pan, light a fuse like that attached to a fire cracker, and make the exposure. If too much powder is sprinkled on the cotton, the surplus will slowly sizzle in the bottom of the pan. How many pictures of family gatherings will we now see taken by this light? I predict many thousands.

THE SWING BACK TO CAMERAS.

By J. H. Talbot.

When touring this season my attention was continually drawn to amateur photographers with whom I chanced to meet in the course of my daily wanderings in search of some pretty spot which might form the subject of my next picture. Many of these amateurs were quite ignorant of the importance of the swing back, and some did not know that such a thing existed in their cameras until I conversed with them and pointed out its use and advantages. They seemed quite astonished to see the difference this made to their pictures in sharpening up the foreground or distance as the case might be.

The vertical swing is the most important, as this regulates the sharpness of the top or bottom of the plate, viz., the sky or foreground. All photographers should have a camera with at least this one improvement, or, better still, if the camera is made with double swinging back, viz., with the addition of the horizontal or side swing as it is commonly called, although this is not so often used as the vertical movement. There are two ways in which a camera is fitted with the vertical swing; but there are various modes and patterns adopted by the different manufacturers, one is to swing the back part of the body from the baseboard, the other swinging from the centre of the back body by means of an extra frame. The horizontal swing is generally used by means of two rods passing through the back body and clamped by nuts on the top. A few makers give both the swings from the baseboard. I have used several different patterns. The heaviest or general style of

long-focus cameras I have found the most suitable for rough usage, but I must certainly say I strongly object to their weight when touring, and, therefore, I resolved to try one of the new light cameras now in the market. I purchased a folding tourists' camera called the 'Imperial,' manufactured by Messrs. Sands & Hunter; this is fitted with their new patent swing back, which can be used for either the vertical or horizontal movement. It is adapted to the centre of the back body of the camera. It is a very ornamental as well as a useful improvement, and a novel invention. I found this camera most useful when using my very short-focus, wide-angle lens, which I was unable to use last year on account of the front projecting baseboard cutting off the field.

PHOTOGRAPHY ON WHEELS.

By W. England.

I believe a very large number of the profession indulges in the very healthy exercise of cycling, and they will considerably enhance their pleasure if they add a small apparatus to their outfit, and may by this means secure many mementoes of their outings. Some I know already do so, but to those who have not I offer the following suggestions, based on considerable experience.

A quarter-plate camera is quite large enough to manage comfortably, and, if fitted with a small doublet lens having a central shutter and rotating stops, like those made by Messrs. Shew & Co., it may be used for instantaneous or ordinary views. I may also mention the camera having a fixed focus, no time is wasted on the spot focussing. I have had one of these cameras fitted in a small black box which also carries three dark slides; this arrangement does not attract so much attention when one is taking street views. By fixing this box on the steering-bar of a Cripper tricycle the exposures may be made without having to carry a stand.

I must say my greatest pleasure has been in taking instantaneous views, and this is much facilitated by being able to move about quickly on a tricycle. I do not know that I need say much about manipulations. One thing is of course very important, that for quick work very sensitive plates must be used and also a suitable developer. For instantaneous work I have met with the greatest success by using the potash developer made in the following manner:—

Pyro Solution.

Hot distilled water	4 ounces.
Sulphite of soda (chemically pure)	3½ ,,
Dissolve and then add:—	
Sulphurous acid	4 ,,
Pyrogallic acid	1 ounce.

Potash Solution.

Water	9 ounces.
Sulphite of soda (chemically pure)	2 ,,
Carbonate of potash (chemically pure)	3 ,,

Dissolve the sulphite in half the water (hot), and do the same with the potash, and the rest of the water cold, mix together when dissolved.

To develop a half-plate take one and a half ounces of water, and add one drachm of pyro solution and one drachm of potash solution. If the plate appears to be under exposed add another drachm of potash solution.

The plates I use are those made by J. Désiré England especially for instantaneous work; I have also used some of other makers, but in all cases the potash developer has proved the most satisfactory.

Before concluding, I may mention a most useful article to cyclists—one of Lancaster's clips; this is particularly useful to attach camera or the box before mentioned to the tricycle.

ALLEGED RETICENCE OF BRITISH PHOTOGRAPHERS.

By Professor Coleman Sellers (Philadelphia).

Reading in the *Photographic Times* Mr. J. Traill Taylor's letter to Mr. W. Irving Adams, of the Scovill Manufacturing Company, days long gone by come to my mind. If you will turn back the pages of The British Journal of Photography about one quarter of a century, you will find my name signed to certain letters from America on photographic subjects.* Those letters were written during what we called the war times—when civil war raged in America. I have preserved with care letters from and to Mr. Henry Greenwood in which war matters were argued with the freedom of intimate friendship. Mr. Taylor says some one comments on the reticence of Englishmen interested in photography in regard to imparting knowledge. Permit me to say I have seen nothing of this, and many warm friends on your side of the Atlantic have corresponded with me, sent me their pictures, and volunteered all sorts of kind advice and information.

I was in London last year at the time of the Photographic Exhibition. I had been in England and Scotland for some months trying what your air would do to build up my system after a severe surgical operation. When ill in London it was a photographer, Mr. Elliott (of Elliott & Fry), who sent me pictures he had collected to interest me, and who would have taken me and my wife to his home at Barnet and nursed me. Though we did not accept this kindness, yet true British hospitality makes my heart glad.

I took with me, over the water, a detective made by myself, and many interesting pictures fill my scrap-book as the result. An American friend, on his way to Egypt, met me in London, and became interested in photography. We together drove all over London, whenever I was able to go out, in search of a Scovill detective, or its equivalent—but could find none; time was too short before he should leave England for us to get one from America. A dealer in London agreed to make a detective like mine in one week. This instrument turned out well, and I have proofs from negatives taken in Egypt by this gentleman with his London detective. We found our detective done up like a paper parcel, but with no finders. We saw others that produced pictures on plates one inch and two inches square, but nothing to compare with the American detective as made by Anthony or Scovill.

In Edinburgh I had occasion to buy some photographic material from

* The name of Coleman Sellers, the talented Professor of Mechanical Engineering in the Franklin Institute of Philadelphia, is ever green in the memory of the photographers of two decades ago in Great Britain. If our highly esteemed *collaborateur*, when his health is sufficiently restored to be able to revisit this country, will only put himself in *rapport* with some of the class referred to, he will meet with such a reception as will surprise him. The honour will be theirs.—Editor.

a dealer. When gave him my name and address, he started, looked earnestly at me and said, 'Did you not write for THE BRITISH JOURNAL OF PHOTOGRAPHY twenty-four or five years ago? Did you not invent one of the early rolling machines for rolling photographs?' &c. When I said, 'Yes.' I found I had not been forgotten, and many were the kind things this dealer, Mr. Turnbull, did for me thereafter, while we were summering in a cottage at Blair Athol.

Again, in 1884, I was in England, and saw Mr. Henry Greenwood for the first and last time in life. We talked over old times. This was but a few weeks before he died.

Last year I went one day to Dalwhinnie for a day's fishing, and there I met C. S. Jones, Esq., F.R.S.—he was mending a split bamboo fishing-rod. I have and value some of his beautiful photographs, and I treasure in thought many acts of kindness and pleasant meetings with him in London when I was ill there. I think I know something abou British photographers, both professional and amateur, and I can recall no act to warrant the charge of selfishness or reticence, but much to the contrary.

I am using with satisfaction a lens made in London by W. Wray, which is admirably adapted to detective work. Since my return home I have made myself a new detective, in form much like the Scovill, but so arranged as to work either with a short-focus Dallmeyer of three and a half inch focus, or the longer focus of, say, five and a quarter inch focus. I give you these foci from memory, writing in my sick room where I am confined after more surgical work, which has left me very weak, but with a certainty of ultimate recovery and, perhaps, many pleasant meetings with my friends in England and Scotland.

THE USE AND ABUSE OF LITMUS.

By JOHN HENRY SMITH, Ph.D., F.I.C.

THE subject of the present article was suggested by two leaders in THE BRITISH JOURNAL OF PHOTOGRAPHY a few weeks ago.

Photography is such a many-sided subject, it is impossible for any individual to become proficient in all the branches of knowledge which have contributed to its present day development. And still the editor of a photographic journal is expected to be thoroughly conversant with the latest discoveries of chemistry, to have a practical acquaintance with the most recent applications of the principles of mechanism, optics, and electricity, and all this in addition to the naturally assumed proficiency in the practice of photography in all its branches. He is appealed to for assistance in every emergency, whether the cause of complaint be an emulsion formula, a dry plate, 'another developer,' a toning bath, a photographic paper or print, a damaged camera, a new instantaneous shutter, a French lens, a silver residue, an electric light installation, a limelight, a magic lantern, or even that most variable of all variables—the weather. He is even asked for friendly legal counsel; he it is who must give the final decree with regard to the permanence or otherwise of bromide prints; and to him we naturally appeal for the concluding evidence relating to the nature of the latent image. It is not very frequently that one has the opportunity, and the desire, and the audacity, to assist in ridding the photographic public of such implicit

confidence in the possible individual possession of such universal knowledge. Still, in the cause of science, and in justice to the editor, it is desirable that an occasional *exposé* should be made of the fallibility of the respected individual in question, upon occasions not essentially *ex cathedrâ*.

After this preambulatory apology for editors of photographic journals generally, I shall now proceed with the subject of litmus.

A box of litmus papers is undoubtedly a most important if not an indispensable item in a photographer's outfit. But the value of litmus has been overrated; because it indicates the point of neutrality in many cases it has been assumed to do so in every case. It is only within the last few years that the subject of indicators has received any marked attention, and the results obtained have not yet been brought prominently before the photographic public. In addition to the solitary indicator of the photographer, the chemist has now at his command methyl orange, phenolpthalein, rosolic acid, turmeric, phenacetolin, cochineal, dimethylamidoazohenzine, congo red, and lacmoid. R. J. Thomson, to whom we are indebted for the systematic investigation of these indicators,* has arrived at the conclusion that 'all the good and serviceable qualities required of indicators are held in comparatively greater perfection by methyl orange, phenolpthalein, and litmus, than by the other seven.'

The following are the characteristics of these three indicators, with regard to those chemicals with which the photographer is more directly concerned:—

Sulphuric, Hydrochloric, Nitric, and Thiosulphuric Acids.—For these acids all three indicators are equally applicable, but if the base of neutralisation be ammonia, or if ammonia salts be present, phenolpthalein becomes valueless.

Organic Acids.—*Phenolpthalein* is the only one of the three which is constantly trustworthy, but in the presence of ammonia or its salts it is rendered useless. *Litmus* is reliable for oxalic and tartaric acids, and it gives approximate results with acetic acid, so that it could be substituted for phenolpthalein in the case of these acids when ammonium salts were present. With citric acid, however, the end reaction is obscure. *Methyl orange* is utterly untrustworthy for the titration of the organic acids.

Carbonic Acid.—*Methyl orange* is the only indicator of the three to which carbonic acid is neutral in the cold. In cold dilute solutions *phenolpthalein* indicates the formation of the acid carbonates of sodium and potassium, and this is useful in many cases. It is only in *boiling solutions* that carbonic acid is neutral to *litmus*, hence the impracticability of rendering an acid toning bath neutral with an alkaline carbonate, using litmus paper as an indicator, as is so frequently recommended.

Chromic Acid.—*Litmus* is entirely useless as an indicator in the presence of this acid. The other two indicators are available, but with this distinction, that the bichromate is neutral to *methyl orange*, while *phenolpthalein* indicates neutrality when the normal chromate has been formed.

Boric Acid.—No reliable indicator has been found for the estimation of this acid. To *methyl orange* it is quite neutral.

* *Chemical News*, XLVII., pp. 123, 135, 184; XLIX., pp. 32–35, 38–41, 119–121; LII., pp. 18, 29. *Journal of the Society of Chemical Industry*, 1887, pp. 195–199.

Sulphurous Acid.—G. Lunge, in a paper on 'The Titration of Sulphurous Acid and its Salts,'* has considered at length the behaviour of all three indicators towards this acid. *Phenolpthalein* is useful as an indicator of the formation of the normal sulphite. As this indicator is absolutely valueless for any determination in which ammonia or its salts are present, rosolic acid is an excellent substitute for the indication of the normal sulphite of ammonium. *Methyl orange*, on the other hand, indicates neutrality when the acid sulphite has been formed, and it can be employed as indicator for the estimation of the sulphurous anhydride in normal sulphites in their titration by an acid. *Litmus* in this case is quite useless. At every stage between the formation of the acid and the normal sulphite it gives an uncertain, but approximately neutral, indication.

When writing the two leaders already referred to on 'Sulphites in Conjunction with Pyro,'† it is evident that the Editors were not aware of this abnormal behaviour of sulphurous acid towards litmus. At the close of the first article, it is recommended to neutralise the 'free alkali' contained in the commercial sodium sulphite with sulphurous acid, using litmus paper as indicator. Here it assumed that because the sulphite solution has an alkaline reaction towards litmus that it contains free alkali, and further that by the addition of sulphurous acid until the solution turns blue, litmus paper decidedly red (the only approximately definite point obtainable, as Lunge has shown), the normal sulphite would be formed. As a matter of fact it is the acid sulphite that is formed at this stage. If, therefore, the Editors actually treat their sulphite in this manner, we must conclude that it is acid sodium sulphite ($Na\,H\,SO_3$) which they virtually recommend to be used in conjunction with the pyro, whatever they may call it.

In the second article the Editors propound a method for the home manufacture of a 'reliable' normal sulphite of sodium, and in this case they commit a blunder more serious, if possible, than that perpetrated in the first article. They pass sulphurous anhydride into a solution of common washing soda until, judging from the quantity of 'hypo' employed, it is estimated that the acid sulphite should be formed. Then a quantity of washing soda, equal to that employed in the original solution, is added, retaining, however, one ounce each of the acid solution and of the washing soda, in order 'that the adjustment of acid and alkali may be accurately performed' with the aid of the 'beatified litmus' paper as indicator. Now, in this case we have not merely the uncertain end reaction of the sulphurous acid itself, but also that due to the presence of carbonic acid, to which attention has already been referred. It is evident that the final product obtained by the Editors must be utterly untrustworthy.

If the normal sulphite be the product most suited for the photographer, and it is essential that it should be strictly neutral, then phenolpthalein should be used as an indicator. If, on the other hand, it is the acid sulphite which yields the best results, then methyl orange must be employed. But in any case let us 'call a spade a spade.'

Unfortunately papers cannot be satisfactorily prepared from phenolpthalein and methyl orange, but Thomson has shown that turmeric

* *Journal of the Society of Chemical Industry*, 1883, p. 513.
† The British Journal of Photography, 1887, pp. 578 and 594.

paper behaves like the former with sulphuric, hydrochloric, nitric, thiosulphuric, nitrous, and the organic acids; while lacmoid paper can be substituted for methyl orange solution in every instance where the latter is permissible. The lacmoid paper must be kept immersed in the solution for a minute or so, but notwithstanding, these papers will be found much more generally convenient to the photographer than the solutions for which they are employed as substitutes.

MOUNTING PHOTOGRAPHS.

By Baynham Jones.

I have tried very many of the published formulæ for mounting photographic prints, the greater number of which are described as perfect safeguards against cockling and distortion of the paper and mounts, but all of which I have found very far from justifying the statements made in their favour.

I have lately made a variety of experiments in this direction, and one of these I think contains the necessary requirements. I was led to try it by an advertisement of a machine for gumming labels, and by which either the whole surface or a single line round the edges of the paper may be gummed automatically. This instrument is admirably adapted to our purpose; but, as at present made, it will only take paper up to about four and a half inches wide. After applying the gum to the print it should be perfectly dried and may be kept ready for use at any time. For this purpose the *surface only* of the gummed part should be slightly damped with a sponge or camel-hair brush, not sufficiently, however, for the moisture to pass through the gum. When this has been done it should be laid down on the dry mounting board and squeezed till perfectly flat, and then placed in a press. As the moisture does not wet either the print or cardboard, no ill effects can possibly arise. If the edges only be gummed, it is advisable to cut a hole in a piece of blotting paper a quarter of an inch less than the print all round, damping it, and then laying down the edge of the print upon it for a few minutes, when it will be ready for mounting.

Should my plan be likely to come into general use, the makers of the instrument would doubtless be induced to make some of them up to, say, twelve inches wide, or even larger. The present pattern will give horizontal lines up to any length, and I think gumming the ends may be dispensed with for small pictures. The makers of the machine advertise a mounting solution which is absolutely pure and not liable to injure any surface to which it may be applied.

A RUBY LAMP FOR TRAVELLERS.

By George A. Carruthers.

To those who in their summer rambles have to change their plates in out-of-the-way places, such as the bedroom of a hotel, a small portable lamp giving a bright light, and occupying little space in our travelling *impedimenta*, is a great boon. The small tin lamps sold for such purposes give a very insufficient illumination, and burn the fingers so when unwarily touched that unless a much larger article be used the photographer is in constant danger of making all sorts of errors, knocking

things over, getting his plates mixed up, exposed with unexposed, and putting them in the slides film side inwards, *&c.*

In any of the American novelty shops to be found in every large town there is to be bought for half-a-crown a very portable silver-plated railway reading lamp, which holds a thick composite candle, and gives excellent light. The body has inside it a powerful spring, the same as a carriage lamp, which keeps the candle as it burns constantly up to the top. It also swings on its supports, and will burn at any angle. To the other end of the arm is an indiarubber sucker, which has only to be slightly wet to make it adhere to anything smooth it may be stuck against, such as glass, or a marble mantelpiece; no fear of it falling. Try and pull it away and the glass will probably yield first, but the least touch at the side of the sucker with the finger, to let in the air, and it comes off at once. There is a small metal cap which screws over the candle end when not in use; when it is there is another screw at the bottom, so it need never get lost.

To convert the above into a lamp for photographic purposes all that is required is a small piece of brass, which anyone can turn themselves on a lathe, and if made to order only costs a few pence. It acts as a platform for the funnel, and of course the worm of the screw must be cut to suit that of the lamp. The edge of the platform is the better if turned up a quarter of an inch to shut out any light that might escape from the bottom of the funnel. The latter is short, about one and a half inches diameter, and of course must be of dark ruby glass. If the refracted light from the top is considered dangerous a small piece of paper or card soon remedies the difficulty.

Irrespective of photography, the lamp is an invaluable adjunct for railway travelling at night when one wishes to read, and will help to pass away many a weary hour. Should the means of attachment be objected to, the sucker can easily be removed and a hook substituted in its place.

PHOTO-MICROGRAPHY.

By William A. Brice (Genova, Italy).

I have had some experience in the following mode of working, which for amateurs will be found as satisfactory as simple. I have made an entire departure from the usual mode of working because I found it offered great convenience in every way. In fact, What is required? To be able at a moment's notice with the light arrangements we are working with, or sunlight if possible, to photograph as it lies the object we have been examining.

For those who are habitual microscopists and have a microscope fully fitted, I would say if you are working with the microscope inclined, set it vertical without disturbing your object—liquid or otherwise—and place it in full sunshine, quarter of an inch below your object, more or less. By a ring of cork or other plan, fix the lower lens of any spare eye-piece—microscope or telescope—you possess, and you will thus have an excellent condenser over your inclined plane mirror, giving a clear three-eighth inch disc or field of well illuminated light with no danger of burning your object. Suppress the long tube and substitute a short, wide, two-inch long tube, with suitable adapters—even corks will do—into which screw

your objective direct. You thus avoid cutting off any of the field, and suppress the eye-piece or use it as above mentioned.

The microscope being on a firm table in the sun, proceed as follows.

Now one word to those who have no microscope. I think our Editor, who knows I have no personal interest in the matter, will not object to my making our readers aware that from Schmidt & Haensch, of Berlin, can be obtained for four pounds sterling such a microscope and stand, with polariscope, object-glass, eye-piece, revolving stage, micrometer, fine adjustment and perfection of workmanship, and cheapness withal, as I never saw in England, and as even Nachet and the renowned Hartnack declined to supply at the price.

Get a case made, or any suitable packing case will do, of sufficient width to hold your microscope upright inside, firmly affixed to a small, thick board so as to allow no side play when once in, yet wide enough to comfortably allow both hands working on the stage. This case set up on end, deep enough to place the microscope in the middle and yet allow free access to the focussing arrangement. Cut out of the bottom of the case, previous to standing it up on end, an opening at bottom, right across up to height of stage or a little higher, as you can, if necessary, paste black paper to cut off light falling on the stage. I use it so that from stage to plate it measures fourteen and a half inches, but any height will do; but once fixed, always work at that, and you will thus know always what you are about and get more perfect each time, whilst by changing the object glass you can obtain any enlargement you require, and thus acquire perfect knowledge of the photographic value of each.

In the top of this case cut a hole, say, to suit a flange for your largest photographic lens, say, half-plate, but let this hole just fit, sliding easily on to the cap of your lens, which for the convenience of Waterhouse diaphragms, removing the lenses from the mounting and keep *in situ* on camera with any shutter which opens and shuts without jar, then, placing your camera with the focussing glass towards the sky with its photo objective mount in the hole and proceed to focus. On the back of your case, but so as not to interfere with the sun's rays to be reflected in your mirror, screw a board upright about six inches higher than your focussing glass, and on this hinge by its frame a common mirror, which now suspend at an angle of about 45° to conveniently enable you to watch from below the image reflected upon your ground-glass, and with a focussing cloth thrown over all it will be splendidly clear, and you work in comfort, standing, and with no expensive mechanism or wax threads, pulleys, &c.

Now to focus, which is the all important point. Focussing is easy if the following fact be kept in mind. The smoothest ground-glass or artificial surface whatever is too coarse, and gratings too expensive, to allow fine focussing; but put this surface in rapid, horizontal motion and the difficulty disappears, and what was a rough, diffused image at once becomes of the most beautiful sharpness and distinctness, in which the faintest and finest lines are admirably visible. Would that some enterprising maker would make us a revolving (by clockwork) focussing glass to be placed in the frame of our usual one and in lieu thereof, because focus the centre correctly, even the size of a sixpence, and the rest will be right, whilst the usual glass will suffice to show position, light, &c. However, not possessing as yet this desirable instrument, I manage thus: Cut a finely-ground glass one inch shorter, but of the same width as your

usual one, and lay it on the grooves and rapidly move it to and fro whilst focussing, doing this horizontally with such a motion as you would use an ink eraser. The result is instantly perfect clearness and sharpness of image, as mentioned.

I might also add some words on the coincidence of chemical and visual focus, but in past ALMANACS our worthy Editor has so often described methods of overcoming the difficulty that I need but refer to their pages, and add hereto, to finish, that the foregoing method of working will be found eminently convenient, as you have nothing to do but cover the microscope with the case in the sun, put on your hat! and photograph, covering all parts but the front with a blanket, shawl, cloth, &c. It is not even necessary to connect, light-tight, the microscope with the camera, as there is no light but that passing through the stage, though a light, loose bellows from camera objective dropping easily over microscope as far as stage, ending with a board and hole smaller than the whole stage, would no doubt be an improvement and add but a shilling or two to the expense.

PHOTOGRAPHING INTERIORS.

By J. HAY TAYLOR (Florida).

WHEN an interior, such as that of a parlour, is photographed, a certain degree of hardness and patchiness often results from the windows being kept open during the exposure. A softer and better effect may be obtained by keeping the blinds down during the greater part of the time. This softens and diffuses the light, although it increases the time; just previous to closing up the camera, the blinds may be opened to give the necessary high lights.

In the event of a clock or other article protected by a glass shade being in the picture, the shade should be removed from it during four-fifths of the exposure, by which means the whole of the details will be beautifully shown, the shade itself being also depicted in a softened manner, and the reflection from its surface then being not offensively strong. Of course the clock should be stopped during the exposure. The reflection from the glass covering of framed pictures can be got rid of by placing a cork behind one side or the other, as the reflection may demand.

REMOVING SILVER STAINS FROM GELATINE NEGATIVES.

By P. SWANSON.

THE stains referred to in the heading of this paper are those which make their appearance most frequently in the winter season, and which are caused by the negative being printed in contact with damp sensitised paper. The colour of the stain is usually a brownish red when seen by transmitted light, but it presents a metallic lustre when viewed by reflected light.

To get rid of those unwelcome visitors on our negatives make a solution of—

Potassium iodide	1 ounce.
Water	2 ounces.

Immerse the negative in this till the stains disappear. Then wash well.

If the stains are of long standing, use a stronger solution, and rub the spots with the tip of the finger. The time taken to remove the stain varies from a few minutes to a few hours according to the intensity of the stain.

For stained varnished negatives, first remove the varnish and proceed as above.

THE MAGNESIUM FLASH LIGHT.

By Arthur H. Elliott, Ph.D., F.C.S. (New York).

When Gädicke and Miethe first brought out their mixture of magnesium powder, potassium chlorate, and sulphide of antimony, a great many of our German friends experimented with it, and obtained some excellent results. But by far the most enthusiastic worker with it on this side of the Atlantic is Dr. Henry G. Piffard, the well-known dermatologist. This gentleman is noted for his neat applications of scientific ideas to useful purposes, and as he became interested in the new flash light, it occurred to him that the Gädicke and Miethe powder, although perfectly effective, was too dangerous for practical use in the studio. As is well known, all mixtures of an explosive nature in which potassium chlorate is an ingredient are what are called percussion explosives, that is, they ignite from percussion or friction. Now it can be readily seen that the Gädicke and Miethe mixture, since it contains a considerable proportion of potassium chlorate is just such a dangerous powder, and one that should not be kept in a photographic studio, unless extra hazardous rates are paid to the fire insurance company. To overcome this dangerous nature of the mixture, Dr. Piffard used gunpowder instead of the chlorate of potassium and antimony sulphide, and the substitution gives a combination that is perfectly successful in taking portraits and groups by the flash light.

Following up his first attempts with gunpowder (three of gunpowder to one of magnesium powder) he was lead to try ordinary negative guncotton, and here also the success was complete. By sprinkling guncotton, such as is used for making negative collodion, with twice its weight of magnesium powder, and then firing the mixture, a flash light is obtained of great rapidity of combustion and strong enough to give a portrait within ten feet of the light. At the Society of Amateur Photographers of New York, Dr. Piffard took a number of portraits by this method, and Mr. George G. Rockwood, of Union Square, is busy getting a large number of illustrations ready for *Anthony's Photographic Bulletin*, each one of which will be made from a negative obtained at night with this new magnesium-guncotton mixture.

There appears to be no difficulty about using the new light, and the demand for magnesium powder has been such that you cannot get a supply of it without incurring great expense.

The size of the grains of the magnesium powder appear to be an important factor in the success of the flash light. It can, of course, be readily understood that the smaller the grains the more readily they will burn, and *vice versâ*. And since it is necessary to get the impression upon the plate before the flash makes the subject move, a large grained powder that burns somewhat slowly will not give sharp pictures, because

the flash, startling the subject, causes a movement of the face before the light is burnt out. This difficulty might possibly be overcome by the addition of some other substance as, for instance, powdered sulphur, but no experiments in this direction have yet been made.

The character of the guncotton is also very important, and experiments are in progress looking to a determination of the kind of nitration of the cotton best suited to the production of the new light.

Altogether, the new source of illumination appears full of promise for usefulness in photographic work in dark weather, and should be a great boon to the English photographer. Of course, much yet remains to be done in the matter of obtaining just the right illumination and distribution of light upon the subject to produce good modelling and artistic effects. Yet from the results thus far obtained there is, no doubt, much more promise in the new magnesium mixture for illumination than there was for the electric light when first suggested as an aid to the photographer.

CALCULATING EXPOSURES.

By F. A. Bridge.

Arithmetic is a beautiful thing, and most of us without a little of it would be considerably inconvenienced; but there are instances where figures may be carried so far that they defeat the end aimed at, which should at all times be to simplify, and not complicate matters.

Where the elements on which the calculations are based are not liable to much change, ‘Reference Tables’ are most valuable, and many of those in daily use are an immense saving of time. When, however, an attempt is made to tabulate something in which *all* the component parts are liable to constant variation, the result should be accepted with great caution, its actual value being very doubtful.

Notably is this the case with regard to ‘Exposure Tables,’ which would be all very well if we always had the same light, a fixed range of subjects, plates always of the same rapidity, uniformly coated, and developed under the same conditions. Unless, however, this very unusual state of things exists, ‘Exposure Tables’ are a ‘delusion and a snare.’

I have developed an immense number of plates exposed by amateurs, and have invariably found, that where the most elaborate calculations have been made from tables in order to ensure proper exposure, all the columns most carefully filled up as to light, lens, stop, plate, time of day, &c., with ‘no end’ of remarks, the errors in exposure have been the greatest. On the other hand, where the particulars given have been concise and few, and the amateur has depended upon his own observation, the negatives have always been more satisfactory. The reason is, that in the latter case the ‘exposer’ thinks for himself and uses his own brains, thus acquiring valuable experience, while in the former he trusts to some one else's. This ‘some one else,’ possibly (except perhaps as an experimentalist), having had no more experience than himself.

It is, I suppose, too much to hope that plate makers will adopt some uniform way of describing the rapidity of their wares. One gives a sensitometer number, which goodness knows is indefinite enough; another calls them, ‘Twenty or fifty times.’ Twenty or fifty times what? The rapidity of a wet plate, presumably. But what is the rapidity of a wet plate? It would be very interesting if we could ascertain the

percentage of 'dry plate' workers who know anything about the rapidity of a wet plate. It was always rather problematical, even in experienced hands—most wet plate workers having several baths in various conditions, with collodions and developers 'to match,' for different kinds of work.

Of course it is difficult, if not impossible, to fix a standard. Most commercial plate makers, however, issue continuous batches of plates of tolerably uniform sensitiveness; when they do not it is usually the result of accident; and, really (except for special purposes), a number more or less on the sensitometer is not of much consequence.

My experience is, that if plates were exposed with *half* the care they are prepared, we should have fewer spoiled negatives; and if amateurs would only content themselves with one make of plate of, say, two degrees of sensitiveness, keep to one developer and thoroughly master it, expose carefully from their own observation and not trust to 'tables,' they would obtain far more satisfactory results. Plate makers might not sell quite so many plates, but they would at any rate not get blamed so frequently for sending out an inferior article, when the cause of failure is in many instances due to errors in exposure, resulting from misplaced confidence in, or imperfect application of, 'Exposure Tables.'

ALKALINE DEVELOPMENT—A NEW METHOD OF INTENSIFYING BEFORE FIXING.

By B. J. Edwards.

Among the multitude of developers of various kinds now in use, or proposed from time to time, the original alkaline developer—pyro and ammonia—still holds its own for general utility, and, except for a few special purposes, is found by experienced workers to best meet their requirements. Not the least among its many advantages is the fact that by simply altering the proportions of the ingredients it is easy to produce at will any desired quality in the negative, from the soft and delicate detail in a portrait negative to the opaque density and clear glass shadows so desirable in a copy of a line engraving. Moreover, by having at command the two forms of developer, giving such widely different results, the latitude which may be allowed in exposure is enormously increased.

For studio work, or where the exposure is known to be correct, the normal pyro and ammonia developer will usually be all that is needed; but when it is required to develop a number of outdoor negatives, taken at different times and under varying conditions of light and exposure, some modification will often be required, otherwise it will be found that the same treatment which will give perfect negatives in some cases will produce hopeless failure in the others. For instance, over-exposed negatives will usually come out flat and wanting in contrast, or if development be long continued the shadows will be too much buried to give brilliant prints.

In order to meet this difficulty it has hitherto been the usual practice when developing a series of landscape negatives to feel the way, as it were, by commencing each with a developer containing a minimum quantity of ammonia, or an excess of pyro, as a safeguard, in order to secure sufficient density in case of over exposure.

This plan is, however, only partially successful, inasmuch as in the

case of plates which do not happen to be over exposed the quality of the resulting negatives cannot fail to be seriously deteriorated, owing to the employment of an unsuitable developer at the commencement; it is too late to remedy the defect by altering the developer after the first action on the film has taken place.

By adopting the plan now proposed (which is exactly the reverse of the method above indicated), much difficulty is avoided; correctly exposed plates are developed as they should be, while good printing negatives are easily secured on plates which have received as much as eight or ten times the normal exposure.

In the collodion process the universal practice was invariably to first bring out the detail in the negative by means of an energetic iron developer, and then, after washing the film, to redevelop or intensify with pyro and silver to the required printing density.

A somewhat similar method of intensification or redevelopment before fixing will be found to work perfectly with gelatino-bromide plates. The *modus operandi* is the same in both cases, except that washing will seldom be needed between the two operations.

The following method of working has been fully tested in practice, with excellent results:—

The development of an exposed plate (correctly timed or not, as the case may be) should be commenced with a developer of the usual normal strength, containing, say, about two grains of pyro to each ounce of solution, with ammonia and bromide in proportion to suit the plates used when working under ordinary conditions. After pouring on this developer the result should be carefully watched. It will soon be seen whether the exposure has been correctly timed, in which case no alteration will be needed, the negative being completed with the required density and detail in one operation. If, however, the plate should appear to be over exposed (which will be shown by the way the details come out without any apparent increase in density), the normal developer must be thrown off at once, and the thin image flooded (without stopping to wash the plate) with the pyro redeveloper; intensification will now rapidly take place, the further development of excess of half tones being checked at the same time. This second development should be continued until the required density is obtained, after which the plate is washed and fixed in the usual way.

The redeveloper consists of a concentrated solution of pyro and ammonia, well restrained, so as to give great excess of density in the most exposed parts of the negative.

The following will be found a good formula:—

No. 1.

Pyro	64 grains.
Citrate of ammonia or citric acid	20 ,,
Distilled water	4 ounces.

No. 2.

Ammonia (·880)	2 drachms.
Bromide of ammonia	3 ,,
Distilled water	4 ounces.

For use mix equal parts of No. 1 and No. 2.

The mixed redeveloper may be used for several plates in succession; it may also be mixed with the ordinary developer in any desired proportion to suit special subjects, while alone it forms a capital developer for reproduction in black and white, or for lantern slides and transparencies on ordinary bromide plates.

By the above system of modifying the development so as to harmonise with the actual exposure given much time is saved, and far more uniform results can be obtained than by the ordinary method—care being taken that all negatives, as far as possible, are sufficiently exposed, so as to avoid failures from under exposure. With under-exposed plates very little can be done; they will never make good negatives. Perhaps the best plan in case of under exposure is to dilute the ordinary developer to about half strength, and wait patiently for the detail, and then finish with the normal developer or the redeveloper, as above, before fixing. *It is useless to attempt to force out the image by the use of a large excess of ammonia.*

Pyro-developed negatives should always be treated after fixing with a clearing solution containing sulphate of iron. This has the effect of removing all stain and changing the colour of the deposit; it also renders the negatives absolutely permanent, so that they will not change afterwards by the action of light.

COLOURED FILMS AND ORTHOCHROMATIC PHOTOGRAPHY.

By Lieut.-Colonel J. Waterhouse (Assistant Surveyor-General of India).

The following brief notes on the present position of orthochromatic photography and of some results obtained by the writer in working with coloured gelatine dry plates may be of interest to readers of The British Journal Photographic Almanac.

In an article on Coloured Films that appeared in the Almanac for 1876 the writer gave a sketch of the results obtained with coloured films up till that time, chiefly on wet and dry collodion plates containing bromide of silver or a mixture of iodide and bromide, and specially with reference to Dr. Vogel's researches upon the increase of sensitiveness of bromide of silver stained with certain dyes for the rays of the spectrum absorbed by those dyes. From these researches the present system of orthochromatic, or, as it is sometimes called, isochromatic, photography has been elaborated.

Almost before the article was published the writer had the good fortune to hit upon a new dye, called 'Eosin,' which, like cyanin (already experimented upon by Dr. Vogel), was found to impart an extraordinary sensitiveness for the yellow and green rays of the spectrum to bromised or bromo-iodised collodion plates stained with it, so much so, that, with some plates, the maximum of photographic action was in the yellow, instead of the blue, as usual. When, however, the stained plates were tried on coloured objects, such as landscapes, flowers, coloured papers, &c., no such very marked increase of sensitiveness to yellow or green could be obtained. This failure was due, as was afterwards pointed out by Messrs. Ducos du Hauron, to the neglect of using a yellow screen, as

already recommended by Dr. Vogel, to lower the excessive action of the blue rays.

No very practical steps seem, however, to have been taken in orthochromatic photography with the eosin dyes till 1882, when Messrs. Tailfer & Clayton obtained a patent for preparing gelatine dry plates containing eosin in combination with ammonia, the latter addition being one of the special points of their patent. Since then the question has been further worked out by various experimenters, with the result that by the transferrence of the centre of photographic sensitiveness of bromide and bromo-iodide from blue or violet to the yellow, an entire revolution has been worked in photographing coloured objects. Instead of the patches of absolute black by which the most luminous yellows in a painting were represented in the photographic reproductions of a few years back, they can now be made to take their proper place as *lights;* while, on the other hand, the dark shadows and distances containing a considerable proportion of blue, which so often came out almost white, in a manner totally destructive of the effect of the picture, can be reproduced in their proper tones as shadows. The importance of correct colour translation in the reproduction of works of art cannot be overestimated, and the new method of working has been adopted by all the leading art publishers for some time past.

Although the exhaustive researches of Drs. Vogel and Eder and others have shown that there are a large number of dyes or colouring matters, chiefly derivatives of coal-tar, which more or less increase the sensitiveness for yellow, orange, and red, of bromide or bromo-iodide of silver in gelatine or collodion, many of those which work well with collodion do not succeed with gelatine, and there is only one group, namely, the eosins, which has been found to give the most satisfactory practical results, both with gelatine and collodion.

These dyes are all derivatives of fluorescin, a pthalein of resorcin. There are several varieties, but the best are those with a bluish shade and particularly erythrosin, an alkaline salt of tetra-iodfluorescin. Of different samples of erythrosin the most suitable, especially when used in conjunction with silver in the film, are those which form a precipitate with nitrate of silver, which remains insoluble, or nearly so, when well washed with distilled water.

The great defect of the plates stained with the eosin dyes is the want of sensitiveness to red, and this has not yet been fully overcome, although the addition of cyanin or chlorophyl has been found useful.

Cyanin, or quinoline blue, imparts to bromide of silver a very marked sensitiveness for the orange rays of the spectrum, and with collodio-bromide plates shows a decided maximum of action between D and C. Its high price, want of solubility in water, its tendency to lower the general sensitiveness of gelatine dry plates, and other defects, render it unsuitable to be used alone, except for special purposes; but it is useful when mixed with erythrosin, in the proportion of about one in ten, for somewhat increasing the sensitiveness to red. Such plates are, however, much less sensitive than plates stained with erythrosin alone. Dr. Vogel has recommended, under the name of azalin, a mixture of cyanin with quinoline red; but this, also, though an excellent colour sensitiser, has in the writer's hands proved wanting in sensitiveness as compared with erythrosin, even when treated with ammonia.

Ordinary chlorophyl by itself, under favourable circumstances, gives bromide of silver in collodion a marked increase of sensitiveness to the red rays of the spectrum, but with gelatine Eder has not found it work so well. Many of the green coal-tar dyes more or less exalt the sensitiveness of bromide of silver in gelatine or collodion to the red rays, but they have not hitherto been found of any practical use by themselves in photographing the reds of paintings and other coloured objects. Even coerulein, which Dr. Eder found to be the best sensitiser for the red rays of all the dyes he tried, shows no special sensitiveness for red when used for copying coloured pictures. The same may be said of gallocyanin, a blue dye which the writer has found to be almost as good a sensitiser for spectrum red as coerulein.

Ives has found the chlorophyl prepared from the blue myrtle or periwinkle (*Vinca minor*) to be specially suitable for orthochromatic photography, either alone or in combination with eosin. He works with collodio-bromide emulsions and uses yellow screens. The published results are very successful and show marked sensitiveness for red.

Xanthophyl, the yellow colouring matter of flowers, has been found by some workers to give good orthochromatic effect.

Of all the colouring matters yet tried none have been found capable of exalting the sensitiveness of bromide of silver to the red rays of the spectrum in the same degree as the eosins and cyanins do towards the orange and yellow rays, and until some means is discovered of doing this red must remain a more or less refractory colour for the photographer to deal with.

Orthochromatic photography is, therefore, at present limited to the use of sensitive bromide of silver films in collodion or gelatine stained with erythrosin or other eosins, cyanin or chlorophyl alone or in combination, in order to obtain greater sensitiveness to green, yellow, orange, and red, than can be obtained without the aid of these dyes. To secure the best results a yellow screen is necessary to reduce the action of the blues.

There are two ways of using erythrosin with gelatine dry plates, either alone or in combination with silver, and it may either be mixed in the emulsion or ready prepared plates can be steeped in a solution of the dye. The latter method is the most convenient.

The plain solution of erythrosin may be used of various strengths, from 1 : 40,000 to 1 : 10,000, or even stronger. Ammonia should be added to the bath in the proportion of one to two per cent. The writer has found that for general purposes the strength of 1 : 10,000 with one per cent. of ammonia, as also recommended by Bothamley, answers very well.

The plates are steeped for a minute or two in the dye solution, and then put away to dry in the *dark*. Some workers recommended the use of a preliminary bath of very dilute ammonia, but the writer has not found it necessary, working in a hot climate.

Of the methods with silver the writer prefers that recommended by Drs. Mallmann and Scolik in the *Correspondenz* for 1886, No. 315, page 590. It gives exceedingly sensitive plates, which with due care keep well. As slightly modified it is as follows :—50 c.c. of an erythrosin solution, 1 : 1000 in water, are heated in a water bath by candlelight or in the dark room, and nitrate of silver solution is dropped in so long as a precipitate falls. The precipitate is allowed to settle, the supernatant liquid

decanted off, fresh distilled water added, and the precipitate thrown on a filter and washed with distilled water till the washings show no milkiness with hydrochloric acid. When this point is nearly reached the dye will begin to dissolve, and with some samples the precipitate is very soluble, and therefore it is important to use pure erythrosin, which gives an almost insoluble precipitate with nitrate of silver. When all free silver has been removed the precipitate is washed in the filter with 2 to 4 c.c. strong ammonia mixed with 20 c.c. of water. This quantity dissolves the precipitate entirely and easily, but if not the ammonia solution can be passed through over and over again till all is dissolved. Water may then be passed through the filter to make up 200 or 300 c.c., forming a bath in which the plates are bathed for one minute. A preliminary bath of dilute ammonia is also recommended for these plates, but the writer has found it unnecessary. Using the medium quantity of ammonia and water, and one minute soaking, these plates show a very strong bluish pink colour when dry, and retain a good deal of colour through developing and fixing, till all the hypo is well washed out, when the dye also dissolves. This bath is rather troublesome to make up, but once made it can be used over and over again, adding a little ammonia from time to time.

Contrary to what might be expected, these erythrosin silver plates have very good keeping qualities. The writer has developed some which had been laid aside in a dark slide for two months at the worst season of the year in the rains, when the air is constantly saturated with moisture. They were quite clean and free from spots or fogginess round the edges. The stained plates are best packed away in the same manner as unstained dry plates, and kept dry and free from contact of air. Packing in boxes is very liable to cause fogginess round the edges.

It is needless to remark that these very highly sensitive plates should be prepared and developed in a very weak light, and kept in the dark as much as possible.

The dark-room light should be red or deep orange. One thickness ruby glass, two Turkey red twill or cherry fabric, and one yellow satein or golden fabric answer well. For developing the Britannia developer seems very suitable.

The writer has found that no plates stained with erythrosin with or without silver give the full maximum of orthochromatic effect in the yellows without the use of a yellow screen. The simplest and most efficient method of using the yellow screen is to place a piece of this structureless collodion film stained yellow with a suitable yellow dye—such as chrysoidin, aurantia, or uranin—in a double diaphragm made of thin sheet brass. Films may be kept at hand of different degrees of intensity, and can easily be changed as required according to the amount of yellow or blue in the picture.

The writer has found that the plan suggested by Captain Abney of throwing a yellow beam of light on to the picture while being copied is a very great improvement. Where sunshine is available, an ordinary mirror covered with yellow glass, or with a film of gelatine coloured with a suitable yellow dye, such as chrysoidin, aurantia, or uranin, may be used. The exposure is lessened to about one-third of that required with the yellow diaphragm, and the result is more harmonious, the reds being particularly improved. The method has the further great advantage, that the sharpness and focus of the image is not interfered with as it is when

yellow screens are applied to the lens, though with thin collodion films in the place of the diaphragm it is exceedingly slight.

In this connexion it may be noted, that, as observed by Draper and Eder, a beam of light passing through a yellow transparent medium greatly increases the sensitiveness of an ordinary unstained gelatino-bromide dry plate for the yellow and red rays of the spectrum. Photographs of the spectrum, lately taken by the writer in this manner through a screen of gelatine stained with chrysoidin, show a very strong maximum of action in the green and yellow between E and D, with fairly strong action extending through the whole of the red. Exposed without the screen on the same plate the spectrum shows a very weak action in these parts, the maximum being between F and G.

It is possible that to this strong sensitising action for the less refrangible rays is due part of the extra sensitiveness of the stained plates for red when illuminated by the yellow beam; but the writer has not found that the latter is of much use in producing an orthochromatic effect on unstained plates in copying coloured pictures, though some operators have produced orthochromatic effects on unstained plates by using screens stained with turmeric. A good deal, however, depends on the composition of the sensitive films, different makes of plates, even by the same manufacturer, behaving entirely different when exposed to the spectrum. Thus another make of plate exposed to the spectrum through the same chrysoidin screen for the same time as the one noted above, shows only medium sensitiveness between F and E, the unstained plate being far more sensitive in the same part.

The use of the yellow beam is, unfortunately, limited to countries like India, where sunshine is tolerably constant, but in large establishments devoted to the reproduction of pictures, arrangements could easily be made for illuminating with the electric light, or other artificial light through yellow screens.

It is even possible, though it seems rather a paradox to old photographers, that a yellow glasshouse would be well adapted for the special purpose of copying paintings, &c., and in the case of a subject with red hair, a freckled face, and a light blue dress, for portraiture also.

It would unduly extend the limits of an Almanac article, already somewhat exceeded, to enter further into the preparation and working of orthochromatic plates by the collodion processes, wet or dry; full details of these and other methods will be found in Dr. Vogel's work on the *Photographing of Coloured Objects*, of which a translation from German into French has recently been published. A variety of formulæ for the staining of gelatine dry plates have been given in papers by Hyslop, Wellington, Bothamley, and others, in the English photographic journals.

It will suffice to say that from the very high degree of sensitiveness gelatine dry plates—treated as above described with erythrosin—show, apart from their special sensitiveness for yellow and suitability for copying work, they may advantageously be used for instantaneous pictures and all ordinary purposes of the landscape or amateur photographer. They will be found specially valuable in bringing out details of the deep shadows under trees or in shady glens, and, with the yellow screen, for distant hills, clouds, and strongly contrasting tints of foliage.

SPOTS ON PLATES AND PRINTS.

By S. Rouch.

Among the numerous causes of spots and defects, both in the production of dry plates and prints on albumenised paper, no one is more prolific than the employment of water which has passed through an indiarubber tube of the light coloured class so commonly employed. If such water be carefully examined microscopically, it will be found to be liberally contaminated with mechanical impurities, which act upon the sensitive surface, whether plate or print, in a deleterious manner.

Among the various methods by which such tubing can be rendered harmless, one is to give the inside a substantial coating of tough collodion. To do this, all that is necessary is to nearly stop up one end, just allowing room for the air to escape, and then pouring in at the other end enough collodion to ensure every portion of the surface being coated by it. The superfluous collodion is then poured back into the stock bottle, the cork removed from the further extremity, and a current of air sent through the tube by applying the nozzle of a common pair of house bellows to the one end to effect the evaporation of the ether.

Melted paraffin wax may be applied in a similar way, and with almost equally good results.

TONING READY SENSITISED PAPER.

By Thos. Forrest.

Ready sensitised paper is such a great convenience that I venture to state it would be universally employed, except in very large business houses, but for the difficulty generally experienced in toning it. This difficulty need not be experienced if care can be taken to neutralise the acidity of the paper previous to or during the toning.

This acidity may be neutralised before toning by immersing the previously washed prints in a solution of washing soda before toning, but this method has the disadvantage of altering the condition of the toning bath, which is likely to cause irregularity of tone. After considerable experience with ready sensitised paper I have found the following toning bath the most reliable, giving any tone desired, from the warmest red-brown to velvety black, with any good brand of paper.

Make up a stock solution of borax two ounces to the quart of water; then, having well washed your prints, pour into the toning dish as much of the borax solution as will be required for the batch of prints in hand (say ten ounces for fifty *cartes*), and add thereto, say, two grains chloride gold, and *immediately* immerse as many prints as desired, and keep moving till toned. After toning pour the toning solution back into the stock solution of borax, and keep in a dark place till next required to tone, when pour out a sufficient quantity of stock solution, and add gold as before (but not in so large a proportion as at first, as there will be some gold in the solution from the previous toning), and *immediately* proceed to tone as before.

This bath may be used over and over again for some time, merely adding gold as required immediately before toning. One great advantage of this bath is that it is always ready for immediate use, and as the gold

is added immediately before toning, no more solution, or gold, need be used than is actually required for the number of prints to be toned. Also when very large batches of prints are to be toned, gold may be added from time to time (even while the prints are in the bath) when the toning proceeds too slowly. No mealiness of prints need be feared with this bath, and as the gold is only added as required for the batch of prints to be toned, it is very economical, one grain of gold being ample to tone each sheet of paper.

It is advisable to warm the bath and the toning dish before use.

THE EFFECT OF HEAT RADIATIONS.

By John Birtles.

It has for a long time been known that heat acts injuriously upon a sensitive bromide of silver plate, and an unsuspected cause of many failures is to be found in their being subjected unequally to high temperatures. There are many bodies which may be brought into near contact with a sensitive surface without affecting it, but which, if warmed previously, will seriously affect it, possibly in consequence of emanations given off by the heat, or possibly in consequence of the raised temperature itself.

Dark slides which have a hinge of certain kinds of leather, or leather cloth, not unfrequently show a stain opposite such material. Black varnish, too thickly applied, is another source of this defect. It is known that when any lettering is made upon one side of the shutter, as in the case of slides formed of cardboard, and which during exposure are withdrawn from the dark slide altogether and returned in a reverse manner (the lettering in such case being to indicate whether the plate has been exposed or not), in many instances plates carried in such slides have, upon development, had the lettering distinctly impressed on the face of the negative. In nearly every case where this has happened it is believed to have been the result of an exposure of the dark slide to the sun, by which the black, printed matter was placed under such conditions as to radiate a greater degree of heat than the other parts. Indeed, the mere placing of a slide for a few minutes upon a warm, sandy soil has often been sufficient to produce this effect.

TO CLEAN PHOTOGRAPHIC PROPERTIES.

By H. N. King.

Some time since I purchased with other items a lot of plate boxes, printing frames, &c., made in the early days of photography, and of excellent quality, but by their appearance they must have been stored in a coal cellar for years. Hesitating as to whether I should consign them to the 'firewood department,' a sample packet of an article very much advertised was left at my door—by its use marvellous results were to be obtained. Taking the packet as directed I set to work on one of the boxes, the result was the dirt flew away as by magic; then with sponge and

mahogany stain I went over the same, following it up with brown hard varnish. They are now filled with negatives and are a treat to look at. If you have any old soiled mounts treat them in the same way, and then follow up with clean sponge, and you will find them useful. Take your printing frames: they will get greasy and slip from the hand, and, perhaps, at the loss of a valuable negative. Treat them in the same way. Do the same with the doors and windows of your studio; with your porcelain trays a few moments' rubbing will astonish you. Serve your cameras, tripods, &c., in the same way, and they will be worth more money; your brass work will look almost new, your zinc trays and glass ware, your rusty iron articles will look beautifully bright.

One hint I may be allowed to give; if you are a family man don't expect to keep the article for your own use, but take my advice and provide Elizabeth Mary Jane with a packet when required. She will work it out and give value for the money on the spoons, the forks, your brass plates, and scores of other items to your benefit, and please the *better half*. If you are a single man you will bless me for the recommendation of how to do it, if *married* (and I speak from experience) I am certain I shall not get into hot water with advising such extra expenditure, but shall get blessed by both.

P.S.—I find I have omitted one very important item in the above, viz., the formula. In this instance you will not be troubled with ten per cent. solutions. I have no interest in recommending a good and useful article, sold at 4*d*. per pound by every oil and colourman, beyond paying for it; but I will rely on the Editor's good nature, and in hopes that the many readers of this will reap the benefit when I say the article is 'Brooks's Soap,' Monkey Brand.

ACTINOMETRY *IN PARTIBUS*.

By H. H. O'Farrell (Madras).

A question frequently put to me by my friends who knew that I had commenced my photographic experiences in India was, 'Do you give much shorter exposures in India than in England?' This was a question I found much difficulty in answering satisfactorily, because in my pre-Bedford Street days I was a raw beginner, and worked on principles (or rather the want of them) the bare recollection of which now causes me a perceptible shudder. Judging, however, from the number of cases of pronounced under exposure with which I was afflicted in those good old days when I used the most rapid plates and a drop shutter and lumped in the ammonia by the wineglassful, I thought myself justified in asserting that the actinic force of a tropical sun was by no means proportional to its calorific capabilities. This, however, was vague, and by no means satisfactory to my desperately accurate friends at the Camera Club, whose passion for absolute fact, like that of the lady in the *Mikado*, amounted to a disease. So I resolved that on my return to the gorgeous East I would endeavour to decide the matter with at least an approach to definiteness, and at the same time while away the tedium of a sea voyage with a few actinometrical experiments.

I used a Stanley's actinometer, more because I happened to have one

by me than for any other reason. With proper precautions—and what instrument does not require proper precautions?—it is a fairly accurate and reliable guide to exposure. The first of these precautions relates to the test colour painted on the glass slip beneath which the bromide paper is exposed. The paper that the firm supplies darkens to a bluish grey under the action of light, and ultimately to a much darker shade of the same colour. The test slip, for some occult reason of which I could never obtain a satisfactory explanation, is coloured a sickly green. The first step, obviously, was to remove the misleading slip, which would have been doubly misleading to me, as I had determined to prepare my own paper. The next step was to provide a substitute. This, as I am sure all who have ever had much to do with matching colours will easily understand, was by no means so easy a task. After considerable trouble of a more or less fruitless description, I made the happy discovery that with the paper as I had prepared it I could do without a test slip altogether, the paper forming its own standard of comparison. Let me explain. I cut a strip from a roll of Eastman B paper and soaked it for exactly ten minutes in a ten per cent. solution of nitrite of potassium. I then rinsed it in distilled water, and allowed it to dry naturally. The result was a paper that attained a beautiful blue colour in a short space of time, and would darken no more, at least perceptibly, under a prolonged exposure. All that was requisite, therefore, was to use the last exposed strip as a test slip with which to compare the piece under exposure.

And now for the results. I am afraid that they are still somewhat rough, first, because my nitrite paper, owing to reckless expenditure at the outset, did not last till I got to India, but gave up the ghost a few days after I had left Aden; and, secondly, because I had made no test in England in the summer months, and lacked a fair basis of comparison. I had, however, experimented with the best light obtainable in September, the month in which I left England, and by the help of Dr. Scott's tables (published in Burton's and other note-books) it was possible to roughly supply the latter defect.

Taking the normal exposure requisite to produce the tint in London at the end of September at 90 seconds for blue sky at eight a.m., and 15 seconds in the sun at the same hour, I found that at Port Said 40 seconds and 10 seconds sufficed to get the same result; in the Red Sea, 25 seconds and 6 seconds; and at Aden, 15 seconds and 3 seconds. Now from Scott's tables I find that the English figures require to be divided by three to reduce them to the normal figure for a June day at noon, which, I take, is the standard. This brings it to 30 seconds and 5 seconds. In round numbers, the morning light at Aden in the middle of October is about double the best midday light of a June day in England. The light, however, at midday in Aden was hardly perceptibly more actinic at noon than at eight a.m.

As Aden is about the same latitude as Madras, and about midway between the extreme latitudes of Southern India, I think these results will probably fairly represent the actinometrical conditions of that portion of the Indian continent. I shall hope to pursue the subject during the present year, and contribute another short note on the subject to the next issue of The British Journal Photographic Almanac.

TECHNICAL ESSAYS FOR YOUNG PHOTOGRAPHERS.

IN TWELVE CHAPTERS.

By THE EDITOR.

In a 'Department for Inexperienced Photographers,' I attempted in The British Journal of Photography to present in simple language to a certain class of readers a few lessons in the practice of the art. It having by some been considered desirable that a similar course should be given in this Annual, I have reconstructed them for this purpose, re-writing them when necessary, and giving formulæ of the latest and most approved nature.

Chapter I.—Emulsion Photography.

Assuming the reader of this class of articles to be quite unacquainted with photography, we open the series by an elementary explanation concerning emulsion photography.

The sensitive material in a plate is usually bromide, chloride, or iodide of silver embedded in some suitable vehicle, such as collodion, albumen, or gelatine. Albumen was the medium in which it was at first formed, and the sensitive film was prepared by mixing with it a small proportion of iodide of potassium or of ammonium, which was then spread upon glass and allowed to dry. The plate thus coated was immersed in a solution of nitrate of silver, by which the silver combined with the iodine, forming iodide of silver throughout the interstices of the film, the potassium or ammonium combining with the nitric acid thus liberated and forming nitrate of potash, which, being soluble in water, was thus lost sight of. Not so, however, the iodide of silver, which being of a light yellow colour, and insoluble in water, remained in the film, to which it imparts a creamy appearance.

Seeing that plates prepared in the manner just outlined were used while wet, especially when collodion formed the vehicle in which the insoluble silver salt was formed, this method of working was known as the wet collodion process. But if the iodide (or other insoluble salt) of silver be the real energetic material which forms the photograph, why, it may be said, not make up a quantity by itself, and then stir it up among the liquid that is to serve as a vehicle? This was done many years ago, and from its thus forming an emulsion arose the term *emulsion photography*. A photographic emulsion, therefore, is nothing more or less than a solution of albumen, gelatine, or collodion, containing, mixed up with it, the sensitive salts (which are none the less salts

because they are amorphous opaque matter) of which the image is eventually composed, after having been submitted to the action of light. The terms 'collodion emulsion' or 'gelatine emulsion' merely indicate the vehicle, and a gelatine or collodion emulsion plate is one coated with an emulsion formed of one or the other vehicle.

When a bromide of silver alone is emulsified in the manner indicated, then it is termed *a gelatino-bromide* or *collodio-bromide* plate or process, and so forth with chloride and iodide. But as chlorine, bromine, and iodine are known in chemistry as halogens, they are not unfrequently spoken of in this connexion as the *haloid salts of silver*.

Sensitive emulsion may be applied to paper (for being printed on in the usual way) as well as to glass. There are two systems of emulsion for paper; one in which the surface darkens directly under the light, the other requiring the aid of a developing solution. Paper coated according to the requirements of both these systems are now commercial productions and may be readily obtained everywhere. As a vehicle in which to emulsify the sensitive salt, collodion possesses a great advantage over gelatine, inasmuch as it is always ready for use; and from the great rapidity with which the film sets, it can be employed for the extemporaneous preparation of plates which will be ready for use almost immediately afterwards, or which, if allowed time to dry, will keep good for a long period. But gelatine in turn possesses an advantage over collodion on account of the greater hardness of the film and the superior sensitiveness. For the photographer whose aim is merely to produce a few plates now and again by artificial light in the evenings, the collodion emulsion, being always ready for use, will afford exceptional advantages.

Chapter II.—How to Make a Negative.

We shall at present dismiss all considerations respecting a camera and stand, taking it for granted that these are already in the possession of the young photographic aspirant, but who does not as yet quite clearly know how he is to proceed to work.

Having mounted the camera on the stand, let it be pointed towards some out-of-door subject on which there is well marked light and shade. This may be a brick wall in a garden or a house at no great distance, by preference one on which the sun is shining obliquely at the time. Should any 'sisters, cousins, or aunts' happen to be in the scene no special harm will arise, only as the first trial may not be all that is desired it is wise to operate under such circumstances as to prevent unpleasant inquiries being made, just at first, as to the measure of success, and to bury one's sorrow in secret.

Rack the lens or camera in or out until the image is seen clearly depicted upon the ground-glass—the focussing screen—of the camera.

Here note that the focussing screen has a twofold use: it serves the purpose of composition by enabling the operator to see precisely the nature of the picture he is ultimately to obtain as a negative, for which purpose he must dodge in or out the legs of his tripod, or rotate the camera a little to one side or the other until he is satisfied with the pictorial effect.

When thus composing a picture it is well at first to do so without any stop or diaphragm being inserted in the lens, as the greatest possible illumination, quite irrespective of sharpness, is here desirable. The proper arrangement of the subject having been secured, next try and make the image as sharp as possible on the ground-glass, which is the second function performed by the focussing screen. It is quite possible that the image may be sharp in the centre and fall away, in respect to definition, towards the sides. To rectify this insert the largest diaphragm and note the effect upon the image. One use of a diaphragm is to extend the area of sharp definition to the extreme edges, another being to extend the range of sharpness from a near to a distant object. Should the first diaphragm not give the marginal sharpness desired, then must each smaller in succession be tried until the sides are sufficiently well defined.

To permit of the image being clearly seen upon the ground-glass, a focussing cloth is necessary. This is an opaque square of black flexible fabric such as velvet, which, when thrown over the camera must be so capacious as to permit of its covering the head of the operator, whose eyes must be at least ten inches from the focussing screen. This cloth, by preventing the light from behind from falling upon the ground-glass, permits of the image formed by the lens being distinctly seen, which without such an adjunct would not be the case. If the beginner is not gifted with very sharp sight, he may with advantage have recourse to the aid of a small magnifying glass so as to ensure the utmost possible sharpness when focussing.

We now turn our attention to the plates. Having obtained a packet of dry plates the suitable size for the camera, they must be brought in a room into which not the slightest vestige of white light finds admission. Let the light proceed from a candle or lamp so carefully covered by deep ruby glass or ruby paper as to render impossible any ray from it escaping into the room, except those transmitted through the coloured screen. The faintest white light falling upon the plates, even for an instant, will cause them to fog and be rendered useless. Having opened the parcel, ascertain which is the coated side of the plate, and place it in the slide, face down, taking care to fasten down the back. Of course this may be done at any time, even one or two weeks or even months anterior to the time of using the plates in the camera, but special care must be taken that the slides containing the sensitive plates be kept away from the light in the interval, because no matter how closely fitting the various parts of

the slide may appear to be, it is not impossible that a little light may be admitted. The precaution of keeping each 'loaded' slide in a bag of black calico or an envelope of brown paper cannot be too strongly insisted upon.

It is in giving the exposure that the greatest errors will be perpetrated at first, and regarding this no rule can be given. If one second's exposure be given at first, the tyro will, upon developing the plate, ascertain whether this has been too much or too little. The mere act of exposing is simple. Having ascertained that the subject is focussed, cap the lens, remove the focussing screen, and insert the dark slide. Draw the shutter from the latter, and when all is ready uncap the lens for a second. Having replaced the shutter, remove the slide to the dark room.

Ferrous-Oxalate Developer.

There are two systems of development, one by iron and the other by pyrogallic acid. We shall describe the former first.

Having previously prepared, in separate bottles, a saturated solution of protosulphate of iron (saturated in the sense that the water can dissolve no more, and that there are undissolved crystals still lying on the bottom) and a saturated solution of neutral oxalate of potash, and having previously added two or three drops of sulphuric acid per pint to the iron solution to ensure acidity, lay the plate down, face up, in a flat developing dish, and pour over it enough water to cover the surface. Allow this to stand, carefully protected from the red light, while three drachms (or *parts*, according to the quantity required) of the iron solution are poured into a graduate, to which is then added a quantity of the potassium oxalate solution sufficient to make two measured ounces. The mixing of these two solutions, colourless in themselves or nearly so, produces a red fluid, the colour of which, however, will scarcely be observed in the red operating light. Now, tilting up the dish containing the negative, pour off the water, and then pour in the ferrous-oxalate developer which has just been mixed. Rock the dish gently backwards and forwards to ensure the liquid passing over the face of the plate, and if the exposure in the camera has been correct, an image will speedily begin to appear on the plate.

The sky and best lighted parts will show first, followed by those portions that were not so well lighted. By slow degrees the whole image will be out. It is desirable to continue the development until the half tones shall have become merged into the high lights, scarcely anything remaining visible but the deepest details. At this stage the plate must be removed from the dish and subjected to a rinsing with water. When held up against the light all the details will now be seen. If these appear to be imperfect it is not yet too late to return the plate to the developing dish for further treatment.

When it is believed that the whole details have been brought out in a sufficient degree, it is rinsed, and then transferred to a dish containing fixing solution. This may consist either of cyanide of potassium or hyposulphite of soda. There are several reasons why the latter may be preferred. In this case a degree of strength of four ounces to the pint of water will be found to make a fixing bath of average strength. By immersion in this solution the white coating of the plate disappears; this can only be properly ascertained by lifting up the negative and examining it from the under or plain glass side. It must remain in this solution a little longer than suffices for ensuring the removal of the white film, after which it is placed in a dish of water to secure the removal of the hyposulphite of soda. In this dish the water must be very frequently changed. It is difficult to say precisely how long a negative should be washed, but it is safe to leave it in changing water for half an hour.

After this it is reared on end to dry.

Chapter III.—Development by Pyrogallic Acid.

Previous to speaking of the effects of under or over exposure, and the means by which such can be discovered, and in some measure rectified, we shall give an acconnt of development by the agency of pyrogallic acid.

The method now to be described is one of several hundred different systems of development employed, for nearly every worker, while giving general adherence to a formula, appears to make some slight departure from its strict letter in order to suit his own special requirement. But pyrogallic development is all based upon one foundation, namely, pyrogallic acid dissolved in water together with an alkali. As regards the latter some prefer ammonia, others one or other of the fixed alkalies, carbonate of potash, carbonate of soda, or carbonate of ammonia, or sometimes a mixture of two or more of these.

At this stage we do not wish to hamper the mind of the beginner by presenting to him a number of formulæ, but shall content ourselves by giving him such simple directions by which to develop a negative as will render it well-nigh impossible for him to fail.

In a bottle or vessel of any kind—a glass tumbler, for example—place a dessertspoonful of common washing soda, previously crushed, and to this add a quantity of water not quite sufficient to dissolve it all. If it does, add more soda till the water will dissolve no more. In another vessel do precisely the same, but substituting carbonate of potash for the soda salt. Now take a bottle having a turnover lip and a nicely fitting cork, and pour into it equal quantities of the two saturated solutions described, and for each ounce of this mixture, whatever the quantity may be, add about twelve drops of strong liquid ammonia. You have now a stock alkaline solution which is always ready for use, and will last a long

time, as it has to be used very sparingly. The vessels in which the solutions were prepared may now be washed out.

Just before developing, and having guessed the quantity of water necessary to cover a plate when lying in the developing dish, and which may be one, two, or three ounces according to the size of the plate, dissolve in this quantity of water pyrogallic acid in the proportion of two grains to each ounce. Having placed the plate in the dish, face up, pour over it the pyrogallic solution, taking care that it is made to flow over and wet the surface thoroughly, thereby avoiding air bubbles, which would show eventually as white spots on the negative.

Having allowed the pyrogallic solution to act on the plate for about half a minute or more, it is then poured off into a graduate or other suitable vessel, such as a porcelain egg-cup, into which two drops of the alkaline solution have been previously dropped from the stock bottle. This alkaline pyro solution is again poured over the surface of the plate, and a sharp look-out kept for the appearing of the image. Do not get flurried or impatient should the image be slow in appearing: it is bound to come. Still, should an unusually long time, say two minutes, elapse without the image coming, it may be necessary to add one or two drops more of the alkaline solution; but it is wise to do this with care, for if too much were added, the negative might develop with an unmanageable degree of rapidity.

After the details are all well out, let the development be continued until they seem to disappear, leaving nothing but the very deepest shadows white. After this remove the negative, wash it slightly under a tap, and transfer to the hyposulphite of soda fixing bath made in accordance with previous directions.

Another formula is a great favourite with the writer, who finds, however, that there are some otherwise good plates in the market for which it is not well adapted, as they pucker up under its action. For such ammonia is recommended as the alkali to be put into the developer.

Make two solutions as follows :—

Solution A.

Sulphite of soda	6 ounces.
Hot water	32 ,,
Make slightly acid with citric acid, and when cold add—	
Pyrogallic acid	1 ounce.

Solution B,

Carbonate of soda	3 ounces.
Carbonate of potash	1 ounce.
Water	32 ounces.

To develop, mix equal parts of A and B, then add two parts of water.

It is sometimes desirable to add double that quantity of water, especially if the exposure has been very rapid.

Chapter IV.—Over and Under Exposure.

In describing the development of a negative, it has been assumed that it has hitherto been a case of plain sailing with the photographic tyro. Some of the rocks or pitfalls which may lie in the way may now be mentioned.

If upon applying the developing solution the image takes a very long time to appear, it may be concluded that either a too brief exposure has been given or that the developer is too weak. If the former be the case, it will be signified by the high lights eventually acquiring vigour, the deep shadows being either exceedingly tardy in appearing or failing to come out at all. If, on the contrary, there be no such wide distinction between the lights and shadows, but only a general disinclination of any image to appear, the presumption is that the fault lies with the developer. The remedy in this latter case is to increase the proportion of the alkali, which treatment will never fail in bringing out the details. It is not wise to add so much as to render the development too rapid. Again, it happens with many brands of plates that the presence of alkali in such a proportion as would effect a very quick development may fog or veil the shadows. This is prevented by the addition of two or three drops of a fifteen-grain solution (*i.e.*, fifteen grains to an ounce of water) of bromide of potassium or bromide of ammonium, the function of which is to prevent any abnormal deposit on the shadows, or to keep them clean. But owing to the retarding influence of the bromide it must be used sparingly. However, it permits of the employment of a larger amount of alkali than it would be safe to introduce into the developer without such a check upon its energy. It is not quite easy to say precisely how much ought to be added, because of the diversity in character of commercial plates, the best treatment for one brand not being necessarily that for another. There are some plates which require no bromide at all, while others are very liable to fog unless a liberal proportion is present.

Should the image make its appearance with too much equality all over, the shadows coming simultaneously with the lights, it may be taken as evidence of over exposure. In this case it is necessary to act promptly, and at once to pour the developer back into the graduate or cup, and add to the solution a liberal dose of bromide, say, four drops or more, according to the circumstances of the case, and having stirred the solution so as to mix it well up return it to the plate which, meantime, has been rinsed. The object of this is to retard the action of the developer upon the shadows, which are thus held in check, while the developing action goes on in the high lights. Under this altered condition of the developer the plate may be subjected to its action for a prolonged period without

danger of the shadows becoming fogged. If it is known beforehand, or very strongly suspected, that the plate has received much too long an exposure, then will it be wise to introduce two or three drops of the bromide solution along with the pyrogallic acid previous to adding any alkali at all, as this will in some measure ameliorate the effect of over exposure, while the alkali may also have its action checked by a similar addition of bromide.

What has been here said applies, of course, to pyrogallic development, and it can be readily inferred that by an intelligent adjustment of the component parts of the developer, or perhaps, more correctly speaking, of the alkali and the bromide, a considerable latitude in the exposure is permissible. In all photographic operations development, more than any other, requires the exercise of judgment. Almost everything else can be effected by a hard-and-fast rule, but development is amenable to the intelligence of the operator, an intelligence that must be exercised in the case of every individual plate.

In ferrous-oxalate development there is not the same degree of latitude as in that by pyrogallic acid, although in cases of over exposure the latent or even partially developed image is amenable to the retarding influence of bromide, a few drops of which may, especially at the initial stage of development, be added with marked advantage. Another factor in facility of development is weakening the developer by the addition of water.

The darkening of the pyro developer, which not unfrequently becomes of a muddy-looking nature after remaining on the plate for a few minutes, may be prevented by sulphite of soda. One of the best ways to employ this salt is to saturate with it the water in which the pyrogallic acid is dissolved. Provided this is done, an aqueous solution of the acid may be made which will keep good for a long time, whereas if it be dissolved in water alone without the sulphite it will decompose with so great a degree of rapidity as to render its preparation in this way a loss.

There are several other additions which may be made to the solution which will prevent the pyro from decomposing, but the consensus of opinion points to sulphite of soda as being the best at present known. It will prove highly educational to the beginner if he will develop a plate without such addition, and note the state in which he finds the developer at its close, and afterwards go through the same operation with a second plate, a liberal proportion of sulphite being mixed with the developer. So clear will it remain in the latter case, compared with the muddiness of the former, that he will be tempted to use it over again on the succeeding plates, which may, in many instances, be done with advantage.

Chapter V.—Albumenised Paper Printing.

Albumenised paper is simply a fine quality of paper, one side of which is heavily sized with albumen in which has been beaten up a certain proportion of a chloride, such as that of ammonium. The object of the albumen is mainly to keep the picture on the surface, thereby ensuring brilliance, for without it the photograph would be produced in the body of the paper and have a sunken, lack-lustre appearance. The object in adding the chloride is to cause the formation of chloride of silver, which is very sensitive to light, more especially when in contact with organic matter such as albumen.

As albumenised paper is now so readily and cheaply procured in commerce, and is prepared of so great excellence, it is not expedient that private consumers attempt its preparation. It is rendered sensitive by floating it for two to three minutes upon a solution of nitrate of silver in water. There is always a certain best strength of this solution, but unless one knew definitely the proportion of salt that has been mixed with the albumen, its determination is left very much a matter of doubt. For example, some albumenisers salt their paper so lightly that a silver bath containing thirty grains of nitrate of silver to the ounce of water suffices; but in the absence of definite instructions it will be found advisable to employ a solution rather exceeding, but not under, fifty grains in strength.

Having poured a sufficient quantity of such solution into a flat porcelain or glass bath, take up the sheet of paper by opposite corners, so as to form it into a curve, and place it neatly down on the solution, so as to prevent any air bubbles forming on the coated surface, or any of the silver solution to flow over its back. This must be done in a feebly lighted room, one by preference into which the light is admitted through yellow paper. Gas or candle light does not exercise any bad influence. In course of its duration on the solution the paper should be raised up by one corner by means of a pair of horn forceps, and examined to see if it is all uniformly wetted. In about three minutes it must be raised up and drawn over the edge of the dish in order to get rid of the superfluous silver solution, and then suspended to dry. This may be done either by wooden spring clips (American clothes clips), or by laying it, back down, over a stout cord stretched across the room. Pieces of blotting-paper should be placed underneath so as to absorb the drippings, and these should afterwards be placed away so as to have the silver recovered from them.

When quite dry the paper is ready for cutting up and being printed upon.

Let the printing be carried much farther than it is desirable it should appear eventually, as by the toning and fixing operations the print be-

comes somewhat reduced. After the printing has been done, place the prints, one by one, in a dish of water, each being allowed to become quite wet before the next is added. This removes most of the free nitrate of silver, which is considerable. The first washings ought, therefore, to be preserved, as the whole of the silver can be recovered, which materially diminishes the cost of outlay. The washing water ought to be changed two or three times, but it is scarcely necessary to keep any but the first washings.

The prints are now transferred, one by one, to the gold toning bath. The acetate toning bath is that which will be found most generally useful, because after it has been made it retains its good working qualities for a long time, whereas some others will not keep good over one day. The acetate bath derives its name from the chloride of gold being placed in solution along with acetate of soda, and it is better that the bath be allowed to stand at least one day after its preparation before being used for the first time. A reliable formula is—

Acetate of soda	30 grains.
Chloride of gold	1 grain.
Water	8 ounces.

After the prints are immersed in this, they will slowly pass from a rather unpleasant red tone to a violet, and afterwards a cold blue colour. As soon as they are seen to pass from the purple to the blue tone, remove them and transfer them, without washing, to the fixing bath, which consists of four ounces of hyposulphite of soda to a pint of water. In this bath they may be allowed to remain seven or eight minutes. Both in the toning and fixing baths precaution must be taken that the free action be favoured by keeping the prints in motion, and not permitting two of them to stick together, as this will cause inequality of the toning action.

After remaining for the time mentioned in the fixing bath, lift up the prints and examine each one by transmitted light, when a peculiar translucence will indicate whether the chloride has been quite dissolved out or not. Should such translucence not appear at first, return them to the hyposulphite solution for one or two minutes longer. It is inattention to the prints at this stage that is the main cause of their fading in after years.

Next place the prints in water, very frequently changed, until the hyposulphite of soda is thoroughly removed from the interstices of the paper. Some printers are so expert as to be able to ascertain this by the application of the tongue to the print, for if the soda be still present there will be a peculiar saline taste. It is well to wash them considerably beyond this stage so as to make sure. Next spread out the prints upon clean blotting-paper and remove the excess of water, afterwards hanging them up or laying them out upon a clean towel till dry.

Chapter VI.—Silver Printing on Plain Paper.

While there is a great charm in a photographic print having a surface as smooth and glossy as glass itself, yet equally so is there a peculiar charm in one totally devoid of all glaze.

It will have been inferred from the previous article that silver printing may be effected on plain paper quite as well as on that which has been albumenised. Many excellent photographs have been made upon ordinary writing paper. If any reader thinks of trying his hand at such practice, he must select a smooth, hard-sized wove, not laid, sample of paper.

This is to be salted by sponging or brushing it over with a solution of chloride of sodium (common salt), six grains to the ounce of water, and then suspending it to dry. But a much richer effect is obtained by the addition of three grains of gelatine, which imparts vigour to the print by keeping it more on the surface without imparting a glaze like albumen. Instead of brushing the solution over, it is much better to pour it into a flat dish and allow the paper to float on it for a minute. When dry it will remain good for a long time.

To sensitise the paper, float it for two minutes upon a bath of ammonio-nitrate of silver, made by dissolving fifty grains of nitrate of silver in an ounce of water (or in a larger quantity, adopting the same proportion), and then adding to it strong ammonia drop by drop. The effect of this addition is to cause a dirty-looking dark brown precipitate to be formed in the previously clear liquid, and the ammonia must be slowly added until indications appear that the liquid is beginning to become clear. Now stop and shake or stir the solution to mix the ammonia with it, when if not yet clear add more, but only by a single drop at a time, followed by stirring or shaking after each drop. Cease adding ammonia after the solution has become *almost* clear, for it is better that this stage be not quite reached than that there be an excess of ammonia. If the mark should have been overshot, a little more solution of nitrate of silver must be added.

This solution, when filtered, forms an exciting solution for plain paper, which yields prints of great beauty of tone. It is not so well suited for albumenised paper. But for plain salted paper, while the above-described ammonio-nitrate of silver bath is undoubtedly the best, yet will a plain nitrate of silver solution also answer well, although, so far as our experience goes, it will not give such rich, deep chocolate blacks as the other.

The paper having been dried is ready for exposure.

Concerning the toning and fixing, this may either be done in the way described in a previous chapter on this subject, or, to save trouble, both these operations may be merged into one. To this end the printing should be carried on till the image is nearly veiled in obscurity, and

the pictures, after being rinsed in plain water, immersed in a bath prepared according to the following directions :—

In four ounces of water dissolve one ounce of hyposulphite of soda, fifty grains of sulphocyanide of ammonium, and thirty grains of phosphate of soda. After these have been dissolved, add to it two grains of chloride of gold previously dissolved in a little (say, two or three drachms) water.

The toning and fixing go on simultaneously, and the prints are allowed to remain in this until they have acquired a very rich black tone, by which time the effect of the over printing will have been obviated by a corresponding reduction.

After removal from the toning and fixing bath, the prints must be well washed.

The solution will remain good for a considerable period by strengthening it occasionally with a few drops of gold solution and the addition of fresh hyposulphite of soda solution. When it is considered to be quite used up by long keeping or frequent use, it may be poured into a convenient bottle of large dimensions, or jar, in which other waste hyposulphite solutions are kept, for at least two-thirds of the silver employed in the sensitising of the paper can be recovered, thus reducing to a material extent the expenses incurred in riding the photographic hobby.

What has been here said about the saving of the waste hyposulphite of soda from fixing prints, applies with equal force to that employed in the fixing of negatives, whether on glass plates or paper.

Chapter VII.—What is the Use of a Diaphragm in a Lens?

The diaphragm, often designated the stop, is an opaque plate having in it an aperture of smaller dimensions than the lens. Its function consists in debarring the transmission of all light except what passes through it, and by its position it can compel one or another portion of the lens to be instrumental in forming the image in the camera. The best part of the lens is, therefore, by its agency brought into use.

The diaphragm is employed for a twofold purpose: it flattens the field by rendering the margin of the picture sharp at the same time that the centre is in good focus, and it gives depth of definition by rendering objects reasonably sharp, whether such objects are situated near to the camera or at a great distance. These advantages are obtained at the expense of illumination. The smaller the diaphragm is, the greater will be the depth or penetration obtained.

To illustrate these uses: let the camera be directed towards a wall, a row of houses, or a landscape, and focus the centre without making use of a diaphragm, or, if any, the largest one belonging to the lens. Examine the image on the ground-glass by a magnifier, and it will be found that the sharpness by which the centre is characterised is confined to a more or less limited area, beyond which indistinctness prevails. Now

insert diaphragms in succession each smaller than the other, and the area of sharpness increases until it embraces the whole of the plate.

The use of the diaphragm in conferring depth or penetration may be shown by arranging a group in front of the camera in such a manner as that some shall be nearer than others. Focus the nearest figure sharply and in most cases it will be found that all the others situated behind this one will be indistinct and out of focus. By proceeding as before directed, that is, inserting one diaphragm after another in succession, eventually one will be found which will bring the nearest and most distant figure into sharpness simultaneously. This applies equally to landscapes as to figures, and indicates the method by which distant hills and objects in the foreground are rendered equally sharp.

We do not here imply that it is always advisable, or in good taste, to make the distance extremely sharp, for, on the contrary, it is frequently desirable that it should be subordinate to the leading theme in the composition so far as regards sharpness.

In a single achromatic lens the stop must be placed next to the flat or concave side, and, with one exception, to the outside of the lens. This exception is in the case of the lens being of an extremely deep meniscus form, when it is often better that the convex surface shall be directed towards the subject. A practical outcome of this will be found in the case of a wide-angle compound, from which it is desired to remove one of the lenses in order to obtain a longer focus, when the back lens may be removed, leaving the front lens alone in its place. But a single trial will determine whether this is the better position with any given combination.

In a rapid combination the position for the diaphragm is about midway between the lenses ; yet it is sometimes attended with advantage that its position be shifted a little nearer to the front. We may here observe that according to the position of the diaphragm in such lenses, so will be the flatness of the field on the one hand and the production of or freedom from linear distortion on the other. With portrait combinations the flattest field is obtained when the diaphragm is near the front lens.

In single landscape lenses it is well to have the diaphragm at the maximum distance from the lens—this ensures flatness; but it is also well to have the power of bringing it close to the lens in order to minimise distortion when taking architectural subjects.

The shape of the aperture should invariably be circular.

Chapter VIII.—The Use of a Swing Back, and the Effects of Tilting the Camera.

It is quite pertinent that an inexperienced photographer should inquire —What is the use of a swing back to a camera, seeing that it increases the expense, adds to the bulk, and that good photographs can be taken

without it? All this is quite true, and yet it has certain uses which we shall proceed to indicate.

To explain its application to architecture, let us suppose that a photographer plants his camera in front of a large building. On looking on the ground-glass, he finds that though the building is square, and otherwise unobjectionable, its upper portion has not been admitted on the ground-glass at all. He naturally will raise the lens as far as the sliding front of the camera will admit of its being done, but this proving insufficient to get in all the upper portion of the building properly, only one course remains, namely, to point the camera upwards till the desired end has been attained. By this means the whole of the edifice is now got on the plate. But it will be found that, as a consequence of this tilting up of the camera, the sides of the building, which previous to the tilting were vertical, are now seen to be converging like a V inverted. In short, the building is distorted, the defect being designated as the *Distortion of Convergence.*

How is this to be remedied? We reply—By allowing the camera to remain undisturbed, but by means of the swinging back bringing the ground-glass in a strictly vertical position, so that, in fact, it is once more brought into parallelism with the vertical plane of the building. All distortion has now disappeared.

A convenient way by which the back can be rendered vertical, after the camera has once been placed, is to have a bit of thread with a small weight at the end, which, when hung at the edge of the ground-glass acts as a plummet, and permits of the back being brought into correct position with speed and accuracy.

But seeing the plate is now standing obliquely to the axis of the lens, the upper part being nearer the lens than the lower portion, it follows that both top and bottom cannot be equally sharp in focus at the same time. This is most readily noticed when a large aperture is applied; but by inserting a small diaphragm the discrepancy is obviated, and all parts are practically made alike sharp. This distortion of convergence is more likely to be noticeable when lenses of wide angle are employed, and, therefore, when using such instruments exceptional care is necessary.

The swing back is also useful, and frequently necessary, in pure landscape work. All good landscapes should, if at all possible, have some salient objects in the foreground, which may consist of shrubs, flowers, stones, grass, weeds, or any of the innumerable objects to be found in nature.

When the view is focussed, and everything harmoniously arranged on the ground-glass, it will be found that the foreground objects, which, if well selected, should impart such a charm to a picture, are hazy from being more or less out of focus.

This arises from their vicinity to the lens, contrasted with the greater

distance at which the other features of the landscape are situated, and by the law of conjugate foci, of which we speak in the last chapter of this series of articles, both cannot be equally sharp on a plane at right angles to the axis of the lens. Therefore, in order that the foreground objects shall be brought into perfect sharpness without interfering with that of the distance, it is requisite that the ground-glass shall be swung back, in quite the opposite direction to that which was necessary in the case of architecture. The top of the ground-glass, on which the shrubs in the foreground are delineated, is now further from the lens than the bottom, the result being that both the foreground and the distance are alike sharp.

It is true that by employing an exceedingly small diaphragm the same end would be attained, but to do so the aperture would be unnecessarily reduced, which would be fatal to quick exposures.

The longer the focus of the lens that is employed in landscape work the more necessary that a swinging provision is made for securing the utmost sharpness of the foreground.

A third use of a swing back is when a portrait lens of large dimensions is employed in the production of a portrait of a sitting figure, especially when the camera is at no great distance from the sitter. The hands, if resting on the knees, together with the knees themselves, are under such circumstances not quite so sharply defined as the face, necessitating a slight swinging of the back to bring them into equality as regards sharpness.

Incidentally we may remark that when copying an architectural picture that has been distorted by the convergence of the perpendiculars, these may be rendered quite rectilinear in the copy by swinging the back, and thus introducing enough distortion of an opposite character to counterbalance that of the distorted photograph which is being copied. The result, as we have hinted, is perfect rectilinearity in the copy thus obtained from a distorted original.

Chapter IX.—The Enamelling of Prints.

While there is a charm in a fine photograph taken on plain paper having a matt surface, there is also a peculiar charm in one of precisely the reverse character, that is, one in which the surface is not only smooth, but glassy, the grain of the paper being obliterated. When a small oval portrait is '*glacéd*' it is a matter of extreme difficulty to distinguish between it and a similar portrait which has been vitrified or burnt in upon an enamel plaque.

But not alone is enamelling applicable to portraiture; landscapes also have a wonderful degree of lustre imparted to them when subjected to the *glacé* process.

In enamelling prints the first requisite is a plate of glass. This must

possess a flat and well-polished surface and be quite free from scratches or other imperfections. The necessity for this will be apparent when we say that the most minute defect on the surface of the glass will be afterwards visible, more or less plainly, on the print when finished. Plate glass should be preferred to any other. The plate having been obtained it must next be made quite clean, a final polish being given with a wash-leather. A number of plates ought to be prepared at a time, and after being cleaned each in succession is stored away in a grooved plate box.

It is difficult to lay down any rule for determining the size of the plates, but it will conduce to ease in working if the dimensions be such as to permit of from six to twelve small pictures being laid down at a time. For half-plate size, four pictures will be a suitable number to place on one plate, two prints of whole-plate size sufficing. But this is a matter for the individual convenience of the operator, who, if he chooses, may employ plates no larger than the pictures.

Next, take a small quantity of powdered French chalk and tie it up in a piece of muslin, so as to form a ball the size of a walnut or an egg. This is applied to every portion of the surface of the plate with a fair amount of friction, beginning at the centre, and taking particular care that no portion is omitted. Inattention to this will cause the picture to adhere to the glass at a subsequent stage instead of stripping clean from off it. Having dusted off the superfluous French chalk, coat the plate with plain collodion. Some of the finest enamels we have seen were made with collodion consisting of four grains of pyroxyline and four drops of castor oil dissolved in half an ounce each of methylated alcohol and ether. But almost any good plain collodion will serve the purpose, provided a little castor oil is added to impart toughness. The plates thus collodionised, after being allowed to stand for half an hour, receive a coating of gelatine which has been prepared by pouring upon it a quantity of cold water just sufficient to cover it.

After standing for a few hours to permit of the water being absorbed, the vessel containing the swollen gelatine is placed in a larger one containing hot water. This immediately effects the liquefaction of the gelatine, which is then filtered through muslin into any convenient bottle having a wide mouth. This bottle should previously be made warm by immersion in hot water, or otherwise, to prevent any fracture which might occur through filtering warm gelatine into a cold bottle.

The gelatine thus prepared is applied both to the collodionised plate and also to the print. In the former case, a little is poured on the centre and spread by guiding it over the surface by a slip of stiff paper or a glass rod, after which the plate is left in a horizontal position until the gelatine sets, when it is reared up on end and allowed to become dry. As the plates when thus treated keep well, enough may be prepared at a time to serve for a whole season.

When required for use, lay one of them face up on a flat table, and having some warm gelatine (from the same stock bottle) poured out into a dish, immerse in it the prints, and then lift them out one by one, and lay them, face down, upon the glass, arranging them side by side, so as to economise space. When they have all been placed down, raise the glass, and looking through it, examine each print carefully to see if no air bubbles intervene. Wherever one is seen, press the paper with a squeegee or the point of the finger and run it out to the margin of the print. We frequently secure the perfect adhesion of the print by passing a wet sponge over the back.

The glass plate with the adhering prints is next reared up in a current of air to dry, and the drying should be of a thorough nature. According to the state of the atmosphere the drying will take from twelve to twenty-four hours. We need scarcely say that by having recourse to a warm (not hot) current of dry air this time may be very greatly reduced.

When dry, strip the pictures from off the glass, and it will be found that they have a surface rivalling that of the glass to which they were attached; this surface consists of collodion, to which they are firmly secured by the intermediate layer of gelatine.

The presence of the castor oil in the collodion so toughens the film as to prevent it from easily getting scratched or otherwise damaged.

Chapter X.—Skies and Clouds.

If one examines a fine landscape having a plain white sky, devoid of either gradation or a semblance of clouds, and then turns to a duplicate print in which there is a sky covered in whole or part with clouds of beautiful form, the difference between these two in point of artistic merit will be immediately appreciable.

Photographers who prepare their pictures for exhibitions are so well aware of this, that in most cases they bestow great pains upon their skies, some of them overdoing it to the extent of reversing what ought to be the correct position of things and making the landscape subordinate to the sky, while others are guilty of the bad taste of printing in one set of clouds on every picture. We have seen in one of our public London exhibitions a row of landscapes by a photographer of repute, all of them beautiful, but each possessing the same individual sky as its fellow. This is not seemly.

One cannot always get a fine sky when he or she arrives at a particular place and finds the scene lighted up for photographing as if 'to order.' Things terrestrial must claim immediate attention, and the sky be left out in the cold.

We shall assume that a landscape negative has eventually been secured in which every artistic and technical condition has been fulfilled.

But the sky; it is a plain dark grey, and detracts from the effect. What is to be done?

If the horizon of the subject be of such a nature as to render it easy to stop out the sky altogether, this might be done. China ink and a finely pointed camel-hair pencil provide the means. It is not necessary that much more than a mere outline to the horizon be thus applied, because the mass of the sky may be blocked out by covering it on the back of the negative with opaque paper pasted on the glass, or by black varnish applied by broad sweeps of the brush. A very good way is to make a print from the negative, cut out the sky portion with a knife or scissors, allow it to continue to darken in the light, and affix this to the negative as a mask.

The result of all this is that we have obtained a well-printed landscape having an unmeaning plain white sky. A simple way of imparting an even graduated tone to the sky consists in laying the print face up on any rigid board—a cover of a book will answer—then placing upon it a plate of glass so as to keep it flat, and placing over all a sheet of card or brown paper. Now step out into a good light and expose the sky to light by slowly pulling down the brown paper cover from the top of the picture to the horizon line. If this be done steadily a beautifully graduated sky will result, one in which the top is darkest, as it usually is in nature, lightening by imperceptible degrees until the horizon is reached, which is left nearly white. This makes a very useful and even pretty sky.

If the photographer be very skilful with the brush we could recommend him, instead of blocking out the sky, to paint on it such clouds as the nature of the subject might demand. A safer way is to have a series of cloud negatives, which may be taken at leisure and retained in stock. These negatives may either be made on glass or paper.

It will conduce greatly to the beauty of a sky if, while it is being printed in from a cloud negative, the method of grading already described be employed.

Clouds can be readily made on the back of a negative by pasting over it a sheet of thin tissue-paper, and working on it with a soft plumbago pencil or a crayon stump. Some even go the length of grinding the back of the negative with emery and water in order to ensure a tooth for the pencil touches. Ground-glass varnish will answer the same purpose, provided it be hard enough to stand the friction of the pencil.

A way we have often adopted with advantage is to make a sky negative on a collodion plate, strip the film off, and attach it to the landscape negative.

If the photographer is so happily situated as to secure a good sky in the landscape negative this is, of course, best of all; but it often happens that such cannot be done, and hence the necessity of such expedients as the subsequent printing-in of clouds.

Chapter XI.—The Focus of Lenses: Back Focus—Equivalent Focus.

The above terms are not only puzzling to inexperienced photographers, but are sometimes troublesome to those who have practised the art sufficiently long to be enabled to take good pictures.

Broadly speaking, the focus of a lens is that place at which rays transmitted through it are made to converge to a point. But this explanation does not cover all the ground.

The term *back focus* is an entirely misleading and unscientific one, and is useful for only one purpose, namely, to afford camera makers an idea as to what lens will suit a certain extension of camera; but as applied to any of the combinitions in use it is absolutely meaningless as regards their focus. It is merely a mechanical term signifying that when any object is in focus on the ground-glass of the camera, this glass screen will be so many inches from the inner end of the lens mount. In one instance only does the back focus convey a correct idea of the real focus. This is when the objective is a single landscape, one of plano-convex form, and in such a case the focus is the distance between the back or convex surface and the ground-glass.

It would serve a much more useful purpose if opticians, instead of speaking of their lenses having such or such a *back* focus (which, as we have stated, means nothing), would give the distance between the face of the flange and the ground-glass, and speak of it as the 'flange focus.' This, although optically absurd, would at least possess the merit of affording a ready means whether any lens in particular would be adapted for use with any definite camera.

Equivalent focus implies a certain something to which it is equivalent. It is so termed from an image formed by it equalling in dimensions that made by a single lens, such as a spectacle glass. Now, let an image be formed on the ground-glass by means of such a glass, and the size of the image—which may be a house, or a portion of a house, or even a couple of trees situated apart from each other—is a factor in ascertaining the focus of any combination of lenses. No matter if the *back* focus of the combination be, say, five inches, and the distance between the ground-glass and the simple lens, which gives an image on the ground-glass the same size as the other, be six or seven inches, the equivalent focus of the combination is precisely that, nothing more or less, of the simple spectacle glass which gives an image the same size as that obtained by the compound lens.

In most lenses of the so-called rapid class the 'equivalent' focus is the distance (approximately) between the place where the stops are inserted and the ground-glass, and this place is (approximately) the optical centre of the combination. An intelligent reader will, from the

foregoing, deduce the meaning of the word 'equivalent,' and will know that it simply means the focus of a single lens, which forms an image the same size as one of a compound nature.

Having explained so much, we now come to the question of ascertaining by other means the equivalent focus of any combination. Seeing that this series of articles is intended for the inexperienced photographer, we desire to make it as simple as possible, and shall avoid describing complex methods.

Place the camera in a window, and point it to a well-lighted scene at a distance. Focus the object, and note that there is a tree, a chimney, or a church spire at one side, the right of the ground-glass, and an equally well-marked object on the opposite side, the left. With a pair of compasses measure the distance apart of such objects, or with a pencil mark their position on the ground-glass. Now remove the lenses from the tube by unscrewing them, and insert a very small stop: a bit of card with a hole punctured in it by a thick pin will suffice. It matters not at what part of the lens mount this punctured card is inserted; indeed, it will serve the purpose equally well if the lens mount is removed altogether, and the card is placed over the flange in the camera front. Now, with a large focussing cloth thrown over the camera and the head, slide the ground-glass in or out until the feeble image formed by the pinhole corresponds in dimensions with the markings on the ground-glass previously made when the lens was in its place. Measure carefully the distance between the card and the ground-glass, and such distance is the equivalent focus of the lens that was employed in making this experiment.

There are other and rather more complex methods by which the equivalent focus may be ascertained, and we refer the reader to THE BRITISH JOURNAL OF PHOTOGRAPHY of February 11, 1887, page 84, where they will be found given with a reasonable degree of fulness.

CHAPTER XII.—LENSES: CONJUGATE FOCI.

Not even the most inexperienced photographer can have examined the image on the ground-glass of the camera without observing that when a distant object is in sharp focus a near one is not so, and *vice versâ;* or if there be a small party in a garden, and one is seated at a distance of six feet, and another at ten times such distance, that a sharp focus of either of them is obtained at the expense of the other. Why is this?

If a camera be directed to an individual seated in front, the lens will form a miniature reversed image of such individual in the air. This image will not be seen unless the rays of light were intercepted at the focus by some diaphanous body, such as a small column of smoke, in the midst of which the figure would be seen in apparent solidity of a certain kind. If, instead of smoke, the image was received upon a sheet of

ground-glass, it would be obvious that where this glass intersected any special portion of the image in air such part only would be seen depicted in the highest degree of sharpness.

What we are seeking here to establish is that there is a relation between the varying distances from the lens of objects in front of it and the corresponding parts of the image behind the lens. This relation is a conjugate one, and is known as conjugate focus. There are, therefore, two conjugates—the object in front of the lens, or *anterior conjugate*, and the point behind, in which the rays from such object cross, in which the ground-glass must be placed in order to see the image sharply, or the *posterior conjugate.* In proportion as the object in front is brought closer to the lens, so does the posterior conjugate, or, briefly, the focus, recede from it or become lengthened, so that in this relation a lens has no definitely fixed position of focus at all—this being dependent entirely upon the distance away of the anterior conjugate, or object that is being focussed.

A knowledge of the subject of conjugate foci is useful under many circumstances, more especially in copying. And in this connexion we may say that if a picture is to be copied its own size, the anterior and posterior foci will be similar, and that *each* of these will be equal to the solar or equivalent focus of the lens doubled. Thus, for example, if a lens of ten inches is to be employed, that is, one which would produce a focus of a distant object at ten inches, by bringing the object—which in this case is the picture that is to be copied—sufficiently near to form on the ground-glass an image the size of the original, it will be found that this condition of equality of dimensions can only be secured when the object is twice the equivalent focus in front of the lens, and the ground-glass precisely the same distance behind it. Hence, to make a copy of a picture with a lens of ten inches focus, the distance between the focal centre of the lens and the ground-glass must be twenty inches, the picture being at a like distance in front. A copying camera to reproduce a transparency from a negative would, therefore, for such a lens, require to be forty inches in length.

It would only trouble the inexperienced reader were we at this stage to inform him of the rules by which conjugate foci are calculated, so we abstain from giving any of them in this chapter, more especially as the subject is treated more fully in the series of articles on 'Enlarging,' commencing on page 267 in the present Annual.

For Contents, *see p.* 565.
For Formulæ, *see p.* 517.
For Index to Advertisers, *see p.* 583.
For Postal and Telegraphic Addresses, *see p.* 688.

EPITOME OF PROGRESS DURING 1887.

By the Editor.

PHOTO-MICROGRAPHY—LIGHTING THE OBJECT.

It is the opinion of Mr. W. H. Walmsley that, as regards a lamp burning coal oil, any form capable of being placed at a proper height to suit the stage of the microscope may be used, though some are undoubtedly better than others. The one he has adopted, and finds eminently useful, consists of a broad, flat reservoir, with large capacity, carried at any desired height upon an ordinary retort stand, and using a duplex burner, with the flames placed at an angle to the plane of the stage, in order to avoid the dark spot in centre of field which always results if the flames present their edges to the object slide. The stage of the microscope should be provided with a set of diaphragms of various sizes, the arranging of the object being done with a large opening, whilst the exposure is made with the smallest which will properly and evenly illuminate the field of view. If desired, a condenser can be used to concentrate the light upon the object; but for a long time, he says, I have entirely discarded its use with all powers lower than one-fifth of an inch, using the direct rays proceeding from the lamp alone. This gives a more evenly lighted field, and, although the length of exposure is somewhat increased, the resulting negative is better in every way than one made in a shorter time by a strongly concentrated light.

The difference, in fact, is very marked, and he urged upon every one using lamplight to dispense with all condensers with moderate and low powers. With high powers, however, a condenser becomes necessary, and an achromatic combination of wide aperture, or one of the Abbé form, may be used with the best results. Some operators use blue or ground-glass for toning and diffusing the light. In short, the subject of illumination is an exhaustless one, and he should not attempt to pursue it further at present. Neither could he give any certain rules as to time of exposures. The length of these vary greatly with the nature and structure of the subject, so that every one must learn to determine this for himself, as in ordinary photographic work. Using a given objective, and with the same plates and illumination, he had had exposures vary from ten seconds to five minutes, regulated entirely by the difference in the colour and structure of the subject to be photographed.

CAPACITY OF GAS BAGS.

The capacity of a bag (says Mr. A. Scott, in The British Journal of Photography) is usually calculated by multiplying together the three dimensions—length, breadth, and depth; this result being halved gives the capacity of the bag as a wedge with flat sides. But as the sides do not remain flat, but bulge out considerably under pressure, the capacity is thereby increased—hence it is customary to add one-fourth to the wedge volume, in order to ascertain the amount of gas the bag will contain. Thus, assuming that a bag is three feet long, two feet wide, and one foot in height of wedge, we find its capacity as a wedge with flat sides to be three cubic feet, and adding the amount due to the bulging we get three and three-quarter cubic feet as the amount of gas that the bag will hold.

A bag containing four or five cubic feet is sufficient to supply a safety blow-through jet of 200 candle-power with gas during a two hours' exhibition. Larger bags are used for mixed gas jets, as these require a higher gas pressure. A jet with a moderate sized aperture in the nozzle burner, giving a light equal

to 300 or 400 candles, will need bags holding six or seven cubic feet each; while the more powerful jets with large apertures, giving a light of from 500 to 700 candle-power, should have a pair of bags capable of containing each at least ten cubic feet of gas.

It is, of course, much better to have an excess of gas than too little of it; there should be a little surplus gas left after an exhibition, so as not to run the risk of being short in the case of a slight accidental leakage. This reserve may be regarded as the premium by which the success of the exhibition is insured.

IMPROVED METHOD OF STRIPPING FILMS.

THE Eastman Company have recently made great improvements in the method of stripping films. In order that its precise nature may be known we premise that the negative paper, in course of its preparation, is first coated with a solution of plain gelatine. This merely serves as a substratum, and takes no part in the formation of the picture. After this coating is dry the paper is pressed and then coated with the gelatino-bromide emulsion, to which sufficient chrome alum has been added to render it, when dry, insoluble in hot water.

The old method of transferring the film was this: After the negative was developed, fixed, and washed, it was, while still wet, squeegeed down upon a glass plate which had previously been coated with a thin solution of india-rubber and dried. The negative was then allowed to dry, and was placed in hot water, which dissolved the soluble layer of gelatine next the paper and set the latter free, leaving the insoluble gelatine bearing the image attached to the glass by the indiarubber. Next, a thin sheet of gelatine which had been soaked in cold water until it was quite pliable was squeegeed on to the negative and allowed to dry. When dry the whole was stripped from the glass and any adhering indiarubber rubbed off with the finger.

By this method was obtained a film negative free from granularity, but it had no protection either back or front, and was, therefore, open to the objection raised to paper or film negatives generally, and a varnish was not easy of application. Furthermore, in the development of the image, the pyrogallic acid exerted a tanning action upon the soluble gelatine substratum. Hence very hot water had to be used to effect the removal of the paper backing, and, in some instances, where the development had been prolonged, boiling water even has failed to dissolve the gelatine, and from this cause many negatives were lost.

Here is the improved method of procedure by which this trouble is avoided and the time of the operation curtailed. A glass plate is rubbed over with French chalk, and then coated with plain collodion, such as that employed for enamelling prints, and immersed in water until all traces of the solvents are removed. The negative is now taken from the washing water and squeegeed on to the collodion. The plate is then placed between blotting-paper, under pressure, for a quarter of an hour or so. It is finally immersed in warm water, when the paper easily comes away, leaving the image firmly attached to the collodion. The reason why the paper can be so easily removed by the warm water in this case is that the insolublising action of the pyro on the gelatine is next to *nil* until the latter has become dry. After the paper is removed a thin sheet of gelatine softened in cold water is squeegeed on to the picture and allowed to dry. Next, the gelatine is coated with collodion, and, when this is dry, the whole is stripped from the plate, the collodion applied to the glass forming part of the pellicular negative.

The advantage of this plan of transferring over the old is great. The first drying, which took many hours—sometimes a whole day—is dispensed with; added to this, the risk of the substratum becoming insoluble is avoided, this being a great gain. Furthermore, the finished negative is protected, both back and front, with a film of collodion.

RECORDING TIME AUDIBLY.

At the Camera Club, last spring, Mr. Lyonel Clark exhibited a simple means he had devised to mark time audibly. It consists in supporting a half-second's pendulum on a table stand, on which stand projects, at a right angle to the motion of the pendulum and a little below the pendulum ball, a slip of steel or other hard sonorous metal, which when touched by any passing body shall emit a sound partaking of the nature of a ring, or at any rate a well-developed clink. Suspended to the lower end of the pendulum rod is a bit of string, of, say, an inch in length, which sustains a bit of any hard metal. This goes flip-flap against the interposing strip of metal and records its transit quite audibly.

SILVERING GLASS.

M. H. Bory in *Le Moniteur* gives directions for silvering glass which, although not differing in any essential respect from what has been published, yet enter into details the observance of which tend to ensure success.

The glass to be silvered should be carefully cleaned, then levelled horizontally in a situation in which it is kept heated to a temperature of from 25° C. to 30° C. If the temperature is lower the metal will precipitate but slowly, the deposit will be incomplete, and the silvering bad.

Solution A.

Distilled water	1 litre.
Rochelle salt (tartrate of potash and soda)............	10 grammes.

Put the Rochelle salt in a porcelain evaporating basin with about 250 c.c. of the water, and add to it about 0·5 gramme of nitrate of silver. Heat it to nearly boiling point, by which time all should be dissolved. Add the rest of the water, pour the whole into a beaker, and filter.

Solution B.

Fused nitrate of silver	5 grammes.
Pure ammonia..	3 ,,
Distilled water	1 litre.

Add the nitrate of silver to the ammonia, stirring until almost complete solution has been effected, then add the water and filter. At the moment when required for use, mix sufficient of equal parts of the two solutions by pouring them backwards and forwards from two vessels, after which pour a little of the mixture upon the glass, and distribute it evenly over its surface by means of a piece of chamois leather. Immediately afterwards pour on the rest of the mixture so that it shall well cover the glass without spilling over its sides.

After the lapse of thirty or forty minutes at the most, the silver is precipitated in the metallic state and adheres firmly to the glass; the liquid is then poured off, the deposited surface is gently sponged, rinsed with a little water, the glass placed on end to drain, and when it is dry the back is painted over with varnish or other preservative coating.

To avoid spots and an uneven coating it is indispensable to use absolutely pure distilled water. The argentiferous waste solutions should be saved and the silver in them recovered. When a thicker silvered surface is desired the foregoing operation can be repeated upon the same piece of glass. The vessels used in these operations should always be washed with distilled water.

PHOTOGRAPHING BUILDINGS, ETC.

At the Philadelphia Society Mr. John G. Bullock showed a chart, which was a valuable aid to those who were called upon to photograph buildings or other subjects requiring to be taken from some special point, to obtain the best effect with a certain sized plate or with any special lens. A base line was ruled

across the bottom of the chart, and a perpendicular line down the centre. From the point of intersection the angles radiated, and were ruled off on either side of the perpendicular line, every five degrees being shown, red and black alternately, making it easier to trail them up. Perpendicular lines were ruled on either side of the centre at distances corresponding to length of all plates used. The central vertical line was graduated in inches and centimetres. Horizontal lines were laid off of a length corresponding to the longest plate each lens would cover, and at a distance from the base line corresponding to the equivalent focus of the lens. The angle line, intersecting lens line, and plate line, would give the angle included and the particular size of plate, and any number of lens foci could be laid down, and the angle of any lens or size of plate could be seen at a glance. The chart shown was 22 × 26, but angles of lenses of longer focus could be read by taking half the focus and half the length of plate.

THE ATOMIC WEIGHT OF GOLD.

CONSIDERABLE interest attaches to certain recent exact experiments in regard to the atomic weight of gold, a question to which for years past some uncertainty has clung, owing to the exceeding instability of the various compounds of this metal. But by means of a compound of gold potassium and bromine Professor Thorpe and Mr. A. P. Laurie have been able to arrive at great certainty and exactitude in their calculations. The old atomic weight for gold was 197. Some later authorities (followed by us in our ALMANAC) have given 196, and now the above-named experimenters give us 197·28, if we take oxygen as 16; or if the now commonly accepted Stass value 15·96 be taken, that of gold becomes, according to Messrs. Thorpe and Laurie, 196·85.

PRESERVATION AND RESTORATION OF FERROUS SULPHATE IN SOLUTION.

THIS is done to perfection, says Dr. Kenyon, by resorting to a method used by analytical chemists for reducing the persalts of iron to the protosalts, and that is by the introduction into the solution of ferrous sulphate of small fragments of metallic zinc along with some acid—citric acid will suffice. For the purpose in view, commercial sheet zinc answers perfectly well, and its impurities have the advantage of setting up that galvanic action which is necessary for its rapid action. The analyst, who requires to use the pure metal, has to employ platinum to set up this action.

Any one who tries the experiment of inserting a few strips of zinc into a yellow solution of iron salt will be charmed with the rapidity and perfection of the result obtained after standing a few hours. Hydrogen gas is liberated and must be allowed to escape if an ordinary bottle is used, or it may burst.

The property which metallic zinc has of reducing persalts of iron to protosalts suggests the possibility of employing it for keeping in active condition a ready mixed solution of ferrous oxalate or even of restoring with promptitude and efficiency the solution, after it has been already used for development. In chemistry, above all, it is never safe to prophesy unless you know, and until trial is made one cannot be sure; but should this suggestion prove feasible an immense economy will be effected in saving the large amount of oxalate of potash hitherto wasted.

HOW DR. ROSEBRUGH PHOTOGRAPHED THE INTERIOR OF THE LIVING EYE.

THE feat was performed as follows:—A glass transparency was illuminated by the sun, and reflected into the eye by a piece of plate glass placed at an angle of forty-five degrees to the rays passing through the transparency. The image thrown on the retina was viewed through this glass from a point situated in

the axis of the eye, and a small camera and lens there placed, which gave an image of the picture on the retina, and it is stated that photographs taken with about five seconds exposure by this means were exhibited at the meeting. Of course the pupil of the eye had first to be dilated by artificial means before making this very remarkable experiment, and it is obvious that, even with a five seconds' exposure only, the submitting of the eye to the strong illumination described, and the keeping it motionless for the time required, must have necessitated a considerable amount of painful endurance and steadiness of nerve.

INTENSIFYING NEGATIVES.

M. Richard, of Dampierre, writes to the Photographic Society of France that a negative is reduced by being immersed in a solution of red prussiate of potash, and is equally reduced by a solution of perchloride of iron, but that if it be first plunged into perchloride of iron, then into red prussiate of potash, it assumes a bluish green colour all over, and becomes vigorous almost beyond limit, according to the strength of the solutions and the number of times it is transferred from the one to the other. If the two baths are mixed the effect takes place at once, and further immersions have no additional effect. It is necessary to well wash the surface of the negative between the immersions in each of the two baths. The green tint passes easily to bright blue by a little washing with a feeble solution of ammonia. It remains to be ascertained whether the colours unfavourable to printing can be discharged by any method without at the same time weakening the negative; possibly in some cases the blue tint may prove to be of advantage.

AN ANILINE BLACK PRINTING PROCESS.

Herr Endemann writes in *Archiv* that the paper intended for use in this process should be well sized with an aqueous solution of gelatine in the proportion of one to fifty. The sensitising solution consists of:—

Chloride of sodium	48 grammes.
Bichromate of potash	48 ,,
Vanadiate of soda	0 gr. 10.
Distilled water	960 c.c.

Another solution is made of:—

Sulphuric acid	96 c.c.
Water	480 ,,

When this is cold it is added to the first solution; the paper is floated upon the mixture, and then allowed to dry in a dark place.

The paper when dry, or while slightly damp, is then exposed under a printing frame for about seven minutes to the action of light, after which it is kept in the dark until it is desired to develop the image. It is then exposed for one minute to a mixture of the vapours of water and aniline, next it is placed in an atmosphere of vapour of water kept at a temperature of from 24° C. to 30° C. The image is thus developed in black lines upon a green ground. To remove the green colour it suffices to soak the paper in a one to six solution of ammonia. The print has then to be dried and pressed.

NEW EXPERIMENTS ON THE BITUMEN PROCESS.

The bitumen process, says *L'Amateur Photographie*, is well known, but Professor Husnik has published some new details about it. He says that pulverised Syrian asphalte should be dissolved in double its weight of German essence of turpentine, and agitated every half hour for two days, until a thick syrup is obtained. French or Austrian essences do not give the same results. By experiment the operator finds out what quantity of sulphuric ether should

be employed to dissolve the useful portion of the asphalte. To do this the syrupy liquor is mixed with some of the ether, shaken up with it, and then allowed to rest in a covered vessel; the supernatant solution is then poured off, and more ether shaken up with the sediment and similarly poured off, until additional ether will dissolve scarcely any more. This point can be ascertained by allowing a little of the later ethereal solutions to evaporate. These ethereal solutions should be mixed together, the ether nearly all distilled off, and the thick residue spread out upon zinc plates until it is almost completely dry; the drying will occupy three days, or perhaps four. All these manipulations should be performed by daylight, and not near a candle flame or fire.

The purified asphalte should then be dissolved in chloroform, or in benzine which has been completely freed from water, otherwise the solution will not cover the plate evenly. In three or four minutes this solution will give a dry film of asphalte. With the benzine mix one per cent. of Venice turpentine, add the asphalte, and shake until it is dissolved. It is then diluted to such an extent that a film of it dried upon zinc has a golden yellow colour. The bottle to hold the solution should be made slightly warm, after having been washed with water and well dried by first washing with alcohol and afterwards with ether. Its mouth is closed with a cork.

To use the solution, a well polished plate of zinc or copper is coated with it by the aid of a brush, and the plate is then placed upon a truly horizontal whirling table, in such a way that by rotation a perfectly even film is obtained.

The time of exposure under the negative is from five to thirteen minutes for sunlight, and from three-quarters of an hour to four hours for printing in the shade. Unfortunately the zinc plate must be very thick for etching purposes, and very vigorous negatives are necessary. The most important point is the development of the image, which must be done in a flat dish and by simple washing, for the application of a brush would injure the image. The parts acted upon by light should appear in three or four minutes. The turpentine is then poured off, and the plate washed under a current of water. The plate is next placed in an acid bath, strength one to twenty, drained, dried, varnished, inked, then retouched and engraved in the ordinary way.

INCREASING THE SENSITIVENESS OF COLLODIO-BROMIDE PLATES.

A PLATE is coated with washed collodio-bromide emulsion, in which the haloid salts are bromide of zinc and chloride of cadmium in the proportion of four to one. After coating with the emulsion, the plate is washed in water, then flooded with the following solution :—

Beer	500 c.c.
Water	500 ,,
Egg albumen	25 ,,
Ammonia	30 ,,

The plate is again washed, and then dipped in the following solution :—

Pyrogallol	1 gramme.
Beer	500 c.c.

The plate, when dry, is much more sensitive than one prepared by the ordinary wet collodion process.—*Archiv.*

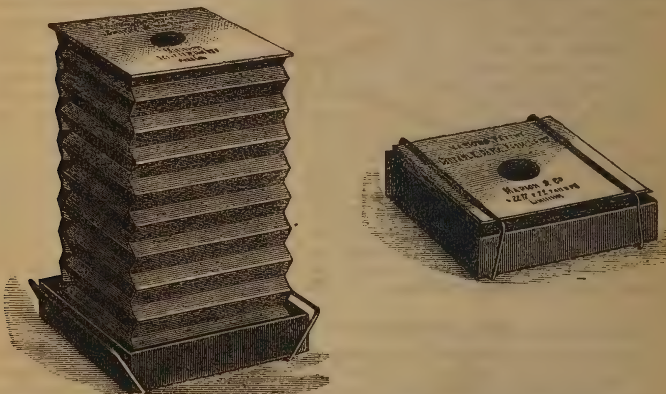
SODIUM CHLORIDE AS AN ACCELERATOR.

AT the Photographic Society of France M. Franck said that he had continued his experiments as to the value of common salt as an accelerator in the developement of geletino-bromide of silver plates, and was more and more an advocate for its employment. His attention was drawn to its use by THE BRITISH JOURNAL OF PHOTOGRAPHY announcing that it was a cure for frilling;

in using it for this purpose he found that not only did it act well for this purpose, but that it had other qualities—that of being an accelerator. After having made several experiments himself, he had requested M. Audra to repeat the same. M. Audra said he was perfectly convinced that sodium chloride was a powerful accelerator. M. Franck laid before the members several plates which had been exposed the same time, and of which some had been developed in the ordinary way with ferrous oxalate, the others with the addition of common salt. All those developed by the addition of the sodium chloride were well developed, full of detail, and dense. Those developed simply by the ferrous oxalate had only a shadow of a picture, although M. Franck said that they had been developed to the utmost to get out a full image.

A DARK-ROOM LAMP.

A COLLAPSABLE dark-room lamp has been introduced by Marion & Co. which adds another to the now rather numerous lamps of this class. As shown by the cut it is composed of a bellows of ruby cloth, inside of which is a spiral



spring which, when released, opens out the body in a Jack-in-the-box fashion. A night-light burner in a tin box forms the source of illumination. Two views are shown in the cut, one being the lamp folded up and the other when expanded.

ARTISTIC *ENTOURAGES* FOR PRINTS.

M. VIDAL has thought of a dodge by which in enamelling photographic proofs an artistic border or frame with the name of the photograph or any other inscription can be had at the same time and without any difficulty. Everyone, writes Professor Stebbing, knows the engraved glass panes in the centre of which carbon proofs are placed, intended to be hung at the window so that the proof can be seen by transparent light. The engraved and ornamented border of the glass makes a whole agreeable to the eye. M. Vidal takes one of these engraved glass plates, the centre of which is of the size of the print to be enamelled—naturally the centre is of plain glass, the ornamentation the same, all the rest of the plate is of ground-glass. This engraved plate is talced, and the photographic proof, obtained by the gelatino-chloride of silver process, is aid and squeegeed upon its surface; when dry the print will leave its support,

and the paper will be beautifully glazed upon the print as well as upon the design—the latter will stand out upon a matt ground. Naturally proofs will be more expensive, as the proofs are printed with a large margin, which margin must be hid from light during the operation of printing. Ordinary albumenised proofs can be enamelled as well, by operating in the same fashion as those who enamel in the so-called 'Parisian style'—collodionising the plate in the first instance and then making the proof adhere to the collodion by gelatine.

A PHOTOGRAPHER'S WATCH.

During the year Messrs. Lezard & Son have introduced a watch of the chronographic order calculated to be of great use to the photographer, who has in it at once a high-class time-keeper and a 'photo-chronoscope.' It is of the stem-winding or keyless genus, having an appearance similar to that shown in the accompanying cut. It is finished with extreme care. There is a long, poised,

steel hand, as fine as a hair, which reposes at zero (at the twelve o'clock chapter), but which, upon pressing the gold button at the top of the pendant, instantly starts into action and continues its rotation around the dial, marking fifths of a second. Every time it makes one revolution, and just as it passes the zero point, another hand on the smaller circle below, and which, like its nimble brother that radiates from the centre, has been standing dormant at its own zero, immediately makes a start and records the fact that the first minute has passed, another and similar start taking place simultaneous with each rotation of the seconds' hand. When the event, whatever it may be, that necessitates this recording of time has transpired, the same button is again pressed, the consequence of which is that these recording hands are instantly arrested in their motion, and entirely disgeared from the watch movement, which goes on recording time as usual. The position of the recording hands being noted, once more is the button pressed, by which action the two

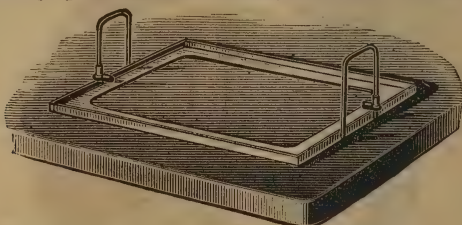
recording hands immediately fly to their original positions at their respective zeros, where they remain until they are started into life by the pressure upon the button. To the photographer these instruments, which are but little over the price of a watch of equal excellence, cannot fail of being exceedingly useful in recording exposures, the duration of development, or, indeed, anything necessitating an accurate measurement of time.

OBVIATING FOG IN PLATINUM PRINTING.

Mr. H. M. Hastings has exposed platinum paper for one minute to daylight to fog it before printing, and on developing with carbonate of potash solution cold, to which a mere trace of hypochlorite of potash had been added, it developed a clean picture; other portions of the same print otherwise developed were thoroughly fogged. Another piece of platinum paper exposed in the open air near damp blotting paper for twenty-four hours was likewise developed in the same way without fog. The amount of hypochlorite added was in proportion to the depth of the printing; in the case of fogged paper the printing had to be very deep. He believes that this information will be useful to those who have old platinotype paper which they think to be fit only to throw away.

PORTABLE DEVELOPING TRAYS.

These are introduced by Mr. W. Tylar and are formed of Willesden paper. They fold flat when out of use, but are converted into trays at a moment's notice by turning up the sides and fastening them at the corners. They are



employed in connexion with a very convenient plate-lifting frame, by the aid of which every operation, from development to the final washing of the plate, can be performed without the fingers coming in contact with either the plates or the chemicals used. The drawing shows its construction.

MOUNTING ALBUMEN PRINTS ON ANY KIND OF PAPER.

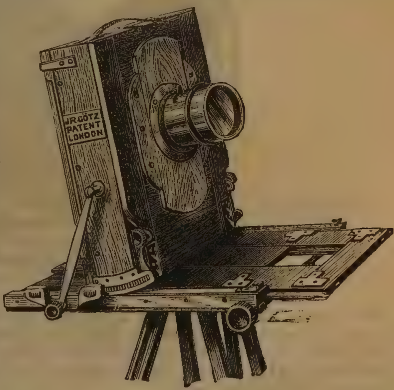
Writing in *Anthony's Bulletin*, Professor Rood says that the impossibility of mounting albumen prints on note paper or printers' paper with the ordinary materials is perfectly understood by all photographers. Books cannot be illustrated by albumen prints without the employment of cardboard, nor can the amateur paste his production in a letter without encountering an amount of crumpling and cockling which destroys alike the appearance of letter and photograph. An attempt has been made to obviate this difficulty by the use of gelatine dissolved in the smallest possible quantity of water, but the formula of Mr. G. W. Simpson did not in his hands yield satisfactory results. After making one or two experiments in other directions, the object being to avoid the use of water altogether, he found that a thick solution of bleached shellac in alcohol answered every requirement for any kind of paper likely to be used, as well as for cardboard, the mounted prints being perfectly flat and firmly

attached. His general practice is to roll up the damp prints, as they come from the washing trays, in little bundles with the albumen face outwards, and allow them to dry spontaneously; each bundle is rolled in a sheet of note or foolscap paper. When the prints are dry they are flattened and placed in a book or portfolio, and are then ready to be trimmed. After this operation the thick shellac is applied, and they are mounted in the usual way, the only precaution being that the shellac must not be allowed to get on the face of the print, as there is no means of removing it; for if alcohol be applied it penetrates the paper and dilutes the varnish, which then makes its appearance on the face of the print in spots. The prints are kept under moderate pressure till dry. The varnish allows a certain amount of adjustment on the mount, quite enough leeway for one accustomed to such operations.

The prints by this means are very firmly attached to the paper; there is no possibility of any injurious reaction taking place between the varnish and the albumen film, for they never come in contact; the print is protected at its back by the most durable varnish with which we are acquainted, and it lies flat. At present he knew of only one drawback to the process proposed: if it is desired to remove a print from its mount, of course *alcohol* must be employed instead of water.

NOVELTY IN CAMERAS.

Mr. J. R. Gotz, has introduced a new form of portable camera which marks a departure in camera making. The chief feature is the suppression of the slotted stay or fork common to all field cameras. This is replaced by a solid crank or stay fixed as in his previous patent to a pair of sliding pieces running at the sides of the baseboard. By this arrangement and a pair of pinions which engage in a circular rack flanking the camera at both sides, the central swing is obtained and worked by simple pressure with the hand against the lower part of the camera, producing a circular movement of which the upper pivot of the crank is the centre.



The folding and setting up of the camera are easy of execution, and the facility of bringing the front and back together—practically closed—on the centre of the baseboard without any extension of the latter are points of value.

The accompanying illustration gives a fair idea of the general arrangements.

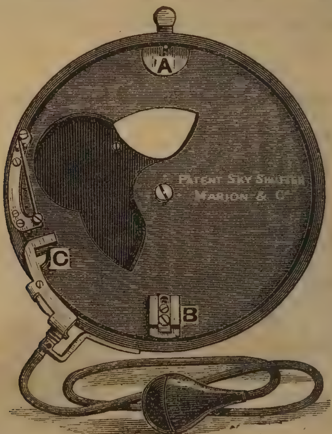
A CHRONOMETRIC SHUTTER.

At the Glasgow Convention an ingenious chronometric shutter, or, more correctly, an arrangement for automatically effecting an instantaneous exposure after a lapse of any required number of minutes, was shown to us by its inventor, Mr. A. Johnston, of Wick. A common cheap watch movement, which can now be purchased everywhere for one or two shillings, has fitted upon its centre wheel or its 'cannon pinion' (that which carries the long or minute hand) a disc of

brass, having in it a deep notch. Pressing against the periphery of this disc is the end of a lever, which when the determined number of minutes has transpired falls into the notch of the disc and releases the catch of the shutter, which gives the exposure. One use of this system is to be found in connexion with captive balloons; but it is applicable to anything in which a determinate degree of time is to elapse between the setting of the shutter and the instant of exposure. The reader will not be slow in imagining many cases to which it might be applicable.

LEISK'S SKY SHUTTER.

THIS shutter, which is manufactured by Marion & Co., is one of the rotating class. The aperture in the rotating and exposing disc is so devised as to give an exposure to the foreground of about three times the duration of that given to the sky, by which are secured those cloud effects which impart such a charm to a landscape. Its formation will be seen from the adjoining illustration.



It is made of ebonite—very light, and can be adjusted to any length of exposure, from about one-fiftieth part of a second to any length desired. It is fitted with Cadett's Patent Pneumatic Release, and this, together with the construction of the shutter, which reduces friction to the minimum, prevents vibration during exposure.

A FINDER FOR THE CAMERA.

PROFESSOR STEBBING, speaking of a visit he paid to M. Chevallier, of Paris, and a simple and cheap finder he saw, says:—It consists of a piece of glass three-eighths of an inch thick in the form of a parallelogram, in height less than an inch; ground concave on one of its surfaces; more or less in depth according to the focus of the lens to be employed. This instrument shows when well chosen the exact resemblance of the objects produced by the lens in the camera. It is small and convenient to carry in one's waistcoat pocket; it is enclosed in a thin brass frame; and can be fixed, either upright or sideways, to the camera at a moment's notice.

REMOVING PAPER NEGATIVES OR PRINTS FROM POLISHED EBONITE SLABS.

NOTWITHSTANDING care in the squeegeeing of these down upon the ebonite slabs, difficulty has frequently been experienced in getting them easily stripped off when dry. Captain Murray has discovered that this can be readily effected by the simple operation of warming the slab. We have tried it and have removed intractable films by doing so.

DETECTIVE CAMERAS.

AT the Convention of the United Kingdom three of this class of camera were exhibited. These we describe seriatim:—

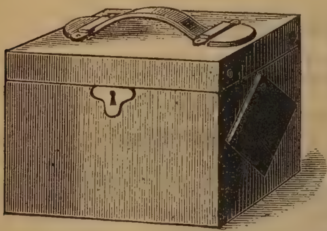
Sharland's Aurora Camera.

When folded up it forms a square box of such small dimensions as, if wrapped in paper and carried in the hand, might easily be mistaken for a box of cigars. The camera contains at the back a reservoir capable of holding twelve or more sensitised plates, quarter-plate size, and by a very simple contrivance they can be exposed one after the other without any danger of the unexposed plates being affected by the light, and there is no complicated mechanism to get out of order. The focussing is effected by a concealed lever which is moved to

marks indicated by the distance of the object to be photographed. When the first plate in the series has been exposed a button outside of the camera is run up in a sunk groove, by which the exposed plate, in its sheath, is raised up in a thin opaque bag, so as to be grasped by finger and thumb and transferred to a receptacle at the back of the others, the next in order taking its place at the focal plane. The cut shows the camera when open, although in practice the lens does not protrude through the front as shown.

The Scovill Detective.

This handy camera, when received by us, had a circular hole in each end, one having a hood covered by a cap. This we removed and covered both apertures by a diamond-shaped plate of ebonite so arranged as to be capable of being turned to one side to expose the lens at the time of taking a shot. A strip of the same material served to prevent the lenses of the finders from being seen. It is now quite impossible to discover that it is a camera even by close observation. Its appearance when carried in the hand is that of an elegant case or cabinet richly covered with black morocco leather. Its dimensions are $10 \times 8 \times 6$ inches.



On opening the lid it is seen that this unsuspecting-looking cabinet contains a 5×4 camera, with a set of three double dark slides, and that the lens is covered by a rotating ebonite shutter propelled by a steel spring, the tension of which is regulated by a lever operated from the bottom of the case. Indeed, the whole operative system as regards the placing of the shutter on whole or half cock, the discharging of the same by touching a button, the regulation of the rapidity of action, and the alteration of the focus (the normal adjustment of which is set for distant objects), is worked from below the outer case. A touch of the finger on the end of a lever cocks the lens shutter, by a similar touch it is discharged, no action of the hands which would excite notice being observed.

There are two finders: one on the top of the box for use when the plate is placed vertically, the other on the side for employment in the horizontal position.

When an instantaneous 'shot' is to be taken at any object, the cabinet, which is being carried in the hand, is raised, and almost simultaneous with this movement, or prior to it by preference, the sliding safety cap of the lens is removed after 'cocking' the exposer, the finder flap is lifted (all these operations being effected in two or three seconds), the finger placed on the exposing button, and the eye directed towards the finder. The object being seen in the centre of the finder, the button is pressed (which is accompanied by a faint click), and all is over. The dark slide is reversed for the next picture, the shutter is withdrawn, the lid closed, and the possessor of this tale-telling instrument moves unsuspiciously among his fellows ready for whatever next presents itself.

A ground-glass, with a peep hole behind, permits of the instrument being employed in the usual way when taking views, groups, or portraits other than those which fall in its way as a detective. To this end it may be erected upon a stand.

The Anthony Detective.

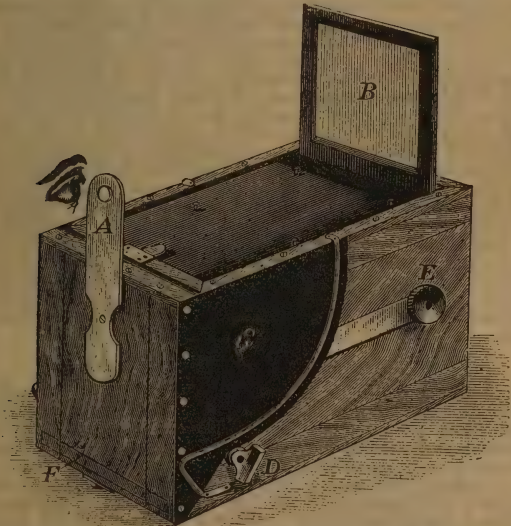
The detective camera by Messrs. E. & H. T. Anthony & Co., of New York, claims attention on account of its ornate appearance. In outward appearance and to the ordinary observer it looks exactly like an alligator hand satchel that is carried by a shoulder strap at the side of the pedestrian. Upon closer observation one sees that it consists of an artfully concealed detective camera, in which all the various movements to secure a picture are situated upon the under side. For use the camera is held so that the base of the satchel rests against the body of the operator. By means of a brass pull at the side the shutter is set. A plate in the regular holder is placed in position at the back of the camera, and the slide is drawn ready for exposure. The release of a short catch exposes the front of the shutter ready for action, and by raising a

small leather-covered lid the little camera obscura called the finder, on the (now) upper side of the camera, shows the position that the object will occupy on the plate. The slightest touch upon a small brass button releases the shutter, and the exposure is made. Replacing the slide in the plate holder, reversing the holder, and setting the shutter again, leaves the apparatus in readiness for another shot, when the plate-holder slide is withdrawn as before. By releasing a spring bolt on the under side of the case, the camera proper can be removed from its cover. When removed from the cover the camera can be used either vertically or horizontally on a tripod, by means of a tripod screw, which will be found in the front compartment of the camera beside the lens. The speed of the shutter can be regulated to suit the speed of the objects, moving with greater or less velocity; while, by simply releasing a catch, time exposures can be made at the will of the operator.

The focussing is indicated by a finger moving over a graduated circle, and which represents, when set to any particular figure, the distance at which everything is in best focus. The finder differs from others that we have seen, inasmuch as it is composed of a tiny camera, with a ground-glass placed at a right angle to the axis of the lens, and the image is observed by means of a mirror set at an angle of forty-five degrees outside the focussing screen. The duration of exposure can be regulated to a great nicety. It accommodates one dozen plates, and altogether contains many points of great ingenuity.

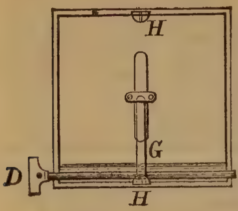
BROOKE'S LANTERN CAMERA.

THIS camera (made by Marion & Co.) is for plates three and a quarter inches square, and is on the 'detective' principle. The lens, shutter, focussing screen,



and dark slide are all enclosed in a box-like form. *C* is a sliding hood, which is lifted when focussing, and takes the place of the focussing cloth. *E* is the

milled head of a pinion, which racks the lens backward or forward for focussing. *A* and *B* form the finder, and are closed down when the camera is not in use.



The novel feature, however, is the mode of opening and closing the shutter of dark slide inside the camera itself. This is illustrated by the smaller cut, in which *D* is the end of a brass bar running through the camera underneath the frame into which the dark slide fits, and attached to this bar is a tongue of metal, *G*. In the shutter of the dark slide is a groove into which this tongue fits. When the dark slide is to be put in the place of the focussing screen, the head *D* is turned back until the tongue is in nearly a horizontal position, but leaning slightly backwards, when the back is placed in position, taking care that the tongue passes into the slab. When the shutter is to be opened the small catch *H* is turned through a small hole underneath the finder *A*, and the head *D* being then turned towards the front by which the shutter opens downwards, and lies down on the bottom of the camera clear of the rays from the lens. After exposure *D* is turned back, and the catch *H* being secured the slide may be removed.

MECHANISM FOR PRODUCING LARGE PRINTS.

Professor R. H. Thurston has presented to the Washington meeting of mechanical engineers some memoranda on the production of large photographs by the usual blue process from engineers' drawings on tracing paper, and exhibited a print eight feet long and more than a yard in width. The method adopted, due to Professor Cleaves, does not require the use of any plate glass, and there is no practical difficulty in executing a drawing of almost any dimensions —ten feet by thirty feet, for instance. Professor Cleaves's apparatus consists merely of a cylinder of a length exceeding that of the widest drawing to be reproduced, and of a diameter such that the longest tracing to be used can be wrapped around it with sufficient space to spare to give room for the clamps by which it is drawn into place and held. The cylinder is smoothly covered with felt, and the sensitive paper carefully wrapped about it, the tracing to be copied being drawn over the whole and held smoothly in its place by spring clamps, which seize its ends. It is found to be easy to lay the tracing smoothly over the surface, and to draw it into contact so perfectly that the work done by this method is even better and more certain than that produced by the ordinary plate-glass apparatus, even with the air cushion now so successfully used with it. It is stated, too, that with a little care and practice it is absolutely easier to make these prints in the manner described than when glass is employed.

AN AUTOMATIC PRINT WASHING WHEEL.

Surgeon-Major S. L. Dobie, of India, thus describes an invention he has made:—In The British Journal of Photography of January 7, 1887, in a leading article on the washing of bromide prints, much stress was laid upon the importance of direct washing with water from a rose, as by this means the hypo is more thoroughly eliminated than by much soaking, even in running water. Actuated by the above, I have had an automatic print washing wheel made by the local tinman, and I find that it works well. I therefore venture to send you a description of it, as I believe it will prove useful to amateurs, and as I hope that the principle is capable by extension of being utilised on a large scale. The principle is that of the overshot water-wheel. Fixed round the circumference of a light wheel is a series of tin plates, each turned up at

one border into a trough. The prints are fastened on these plates and are washed by water from a rose; this water, by filling the troughs in succession, turns the wheel.

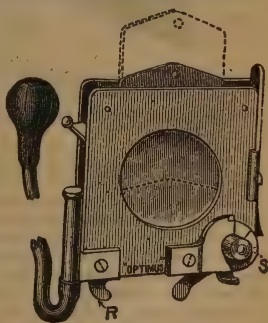
To enter into details, I had better describe a wheel which I have had made for washing twelve cabinet prints at a time. It is two feet in diameter and three inches wide. Round its circumference it carries twelve tin plates with their troughs. The plates overlap the wheel by two inches on each side. Their side edges are turned up a quarter of an inch to keep the water on them. Holes are bored through the plates in positions corresponding to the corners of different sized prints, and the prints are retained in position by means of ordinary pins passed through these holes into pieces of cork at the back.

The rose is a flat one, seven inches wide and tapering to a supply tube three-quarters of an inch in diameter. At its lower end, where it is seven inches wide and one inch thick, it has a single row of small holes three-eighths of an inch apart. This rose allows enough water to wash the prints. It does not waste the water supply, as it uses about nine gallons in one and a half hours, and it suffices to turn the wheel. In fact, it is necessary for the lower segment of the wheel to work in a trough, with a depth of water varying according to circumstances. The water in the trough acts as a break in preventing the too rapid revolution of the wheel, and it further washes the prints. In practice it will be found that the prints, on thick or thin paper, adhere, when wet, to a smooth surface so firmly that they need no pinning on to the wheel.

THE 'OPTIMUS' PLUNGE SHUTTER.

THIS, made by Perken, Son, & Rayment, is an exceedingly neat little shutter.

It cannot, perhaps, be more tersely described, than in the language reported to have been employed by the chairman at a meeting of the London and Provinicial Photographic Association (Mr. J. Traill Taylor), who, when exhibiting it, said that it was the invention of Mr. Perken, jun., and gave either instantaneous or time exposures at will. It had an aluminium flap which was actuated in such a manner as to avoid all vibration or jar from the up and down motions. Although operated by a pneumatic ball and tube, this was not a necessity of its construction, as there was also a small trigger by which the exposure could be made. He (the chairman) considered it one of the best shutters he had seen.



LANCASTER'S WATCH CAMERA.

THIS camera, which we saw at the Convention Exhibition at Glasgow, is when closed up of the form and dimensions of an ordinary watch. On touching a button on the pendant it flies open and a flexible conical body darts out propelled by a spiral spring. The lens, it need scarcely be said, is at the apex of the cone, the plate being in the body of the 'watch.'

PORTABLE WASHING AND DRAINING RACKS.

MESSRS. HINTON & Co. have introduced a portable rack for washing and draining plates. When folded it lies flat and occupies little space, but when opened it serves to hold a dozen or more plates.

The operation of washing is performed by placing the rack, full of negatives,

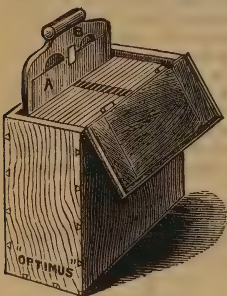
in an ordinary pail, or other convenient vessel, filled with water. Wherever possible it is well to place the whole under a tap and allow the water to run slowly during the time devoted to washing.

Folding handles are provided for the purpose of suspending the rack for drying the negatives; it can, however, be used as a standing rack, or it can be safely hung, by one handle, to a nail in the wall.

There are no loose pieces, and no adjustment whatever of parts is required to prepare it for use; indeed, it is always ready.

A NEW CHANGING BOX.

THIS is a changing box, also of the 'Optimus' brand of manufacture, which is light-tight, simple, and efficient. In the adjoining cut the frame A, containing a dry plate facing towards the frame holder B, and into which it is made to slide very readily, is about to be withdrawn from the box. After it is completely drawn out of the box, it must be inserted into the focussing position of the camera. The frame holder B is enabled to be withdrawn by the action of a spring release, and the dry plate in frame A is left for exposure, light being entirely excluded the while by the margin of velvet on the frame A coming into direct contact with a similar margin of velvet on the frame of the camera next which it is immediately and closely pressed by means of another spring.



Exposure being finished, the frame holder B is inserted between camera and frame A containing dry plate, which frame the holder completely envelopes and transfers to the changing box, not, however, to the same position it originally occupied, but to the opposite end, where a plate of flat metal acts as a partition to separate the unexposed from the exposed plates in such a way as to render it impossible to expose the same plate twice.

UTILISING THE CAMERA GROUND-GLASS AS A FINDER.

IN a communication to the Photographic Convention of the United Kingdom, Mr. Lyonel Clark described a clever way in which he effected the above.

Last summer, he says, I was rigging up a camera specially to take some puppies and kittens, and had intended rigging up a second camera on top of the first. On working out the designs, I at once saw that by far the simplest and easiest method was to utilise the ground-glass of the camera proper, since it could not be required at the time of exposure. I simply turned up the screen then till it stood vertically above the top of the camera, and in a plane of course parallel to the plane of its usual position. On the front of the camera I raised up an extra front above the existing one, and fitted into it a lens of the same focal length as my objective; this lens was in a sliding tube. I now had the framework of a second camera on top of my first one, and throwing a focussing cloth over the whole, I got an image on my upturned focussing screen. To adjust this, I first focussed very accurately the bottom camera, the screen for this purpose being of course turned down on some object. I then, without shifting the camera, turned the screen up, and clamped it there with some brass pieces, and then slid the tube of the upper lens in and out till I got the same object sharply focussed on the screen in its upper position. Now the two cameras, or rather camera and finder, coincide, and of course as I rack out the one the other follows; and the foci of the two lenses being equal, whenever an object is sharp on the turned up screen I know

that it is also sharp on the plate with double back below. There is no need to be particular as to the lens used for the finder—even a spectacle lens will do; but this is objectionable where your lens proper is of a longish focal length, as the spectacle glass is totally uncorrected for spherical aberration, and gives a more or less sharp image over a great depth of focus; a single landscape lens but with the stops removed to give as much light as possible, is undoubtedly the best, except you go to the expense of having twin lenses.

Although the focussing cloth does extremely well as a makeshift, yet in the case of wind something more is required. I have a sort of cardboard body, that folds like one of Ottewill's old collapsing cameras. This is made in the form of a truncated pyramid, it slips with an elastic band over the tube of the finder lens, and so gives the play required, the other end comes over the focussing screen and projects like a box a little way beyond it, and gives the necessary shade to it, so as to allow the image to be seen. Many other ways of covering in the finder will doubtless present themselves to you—a body like a Chinese lantern would do, or even an old bellows, though somewhat more bulky; for you must remember that it is not at all necessary to keep out all light, indeed it is surprising how much you can see with nothing between the eye and the ground-glass.

BACKGROUNDS.

A VERY useful background, particularly for groups, may, says THE BRITISH JOURNAL OF PHOTOGRAPHY, be formed by papering the end of the studio with plain paper, or a wooden frame may be covered with canvas and that papered. Plain paper, of almost any colour or shade, can be obtained from the manufacturers of paper hangings under the name of plain grounds. This is paper merely coloured with the ground colour before the pattern is printed. A background thus made is uniform in tint and very durable. It is also inexpensive. A piece of common brown paper forms a capital background, especially for vignettes, and is cheap. Suitable paper, under the name of carpet paper, about five feet wide and of any length, is supplied, at a few pence per yard, at all carpet warehouses.

One of the best backgrounds that a photographer can have, so far as durability is concerned, is one in flatted oil colour. If a background be simply painted with ordinary oil paint it will prove too glossy, hence the gloss has to be destroyed. There are different ways of accomplishing this. One plan which we have seen adopted is to sift over some fine dry sand after the paint has been applied. This is absorbed by the wet paint, which then dries without gloss. Another way is, when the paint has just become tacky, to dust over the surface some flock—such as that used for wall papers—of the same colour. This plan answers well. The flock may be obtained from the dealers in artificial florists' materials.

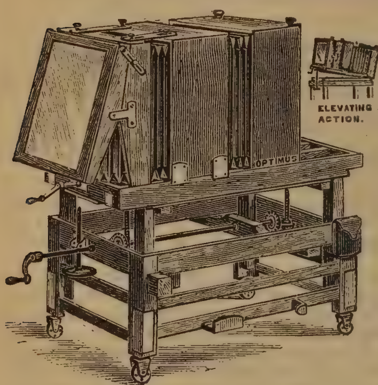
The most general method of obtaining a dead surface on oil colour is by turpentine flatting, which is done as follows:—After the background has been coated with ordinary paint and become dry, it is gone over again with some of the same colour, but this time mixed with turpentine only. By this means the glossy character of the paint is destroyed and the surface left dead. It requires some small amount of skill to apply this coating without leaving the marks of the brush, particularly in hot weather, owing to the volatility of the turpentine. Hence, in flatting a background, it is usual for one person to apply the colour while another stipples over the surface with a large badger-hair brush. Another method of making an oil colour background is by what is known as soap flatting. This is common oil paint mixed with a strong, hot solution of soap. This when applied as ordinary paint dries with a dull surface. It is somewhat troublesome to prepare, but the novice is more likely to succeed with it than with the turpentine flatting just described.

Distemper backgrounds are easy to make, and are very generally used. In

this case the colouring matter is mixed with size and water and applied with a common whitewash brush. These backgrounds are quite as good as those in oil, except that they are far less durable. If a distemper background becomes wetted—as by a leaky roof—a stain, which of course will show in the picture, is produced. This cannot be got rid of without applying a fresh coat of distemper. Also the surface is easily injured by abrasion; a slight rub with any hard substance will produce a mark. If a background be coated many times with distemper the accumulated colour is liable to crack, and, sometimes, to peel off. This never happens with a flatted oil one.

There is a very simple method of producing backgrounds which is well suited to the amateur, though it appears to be little known or seldom used. It consists in applying colour mixed with dextrine or similar material as a dry powder to wet canvas, and then working it in with a brush. Backgrounds of this description are very durable, and are easily repaired should they happen o get injured either by water or by abrasion.

HUMPHREY'S CAMERA AND STAND.



This is an arrangement for studios in which large portraits are taken.

The camera has great length of bellows to admit of lenses of long focus. The table stand possesses two telescopic arrangements; one regulates the elevation of the instrument, giving two feet six inches as the minimum, and four feet six inches as the maximum height of the base, the other enables the extreme length of the bellows of the camera to be drawn out, which in a 30×30 instrument is seven feet. Provision is made for tilting the camera to any desired extent. It is made by Perken, Son, & Rayment.

TONING PRINTS ON EASTMAN PAPER.

M. Vidal says that prints upon Eastman's paper can be rendered more permanent and more agreeable to the eye by toning them in a solution of bichloride of platinum.

Water	2000 parts.
Bichloride of platinum	1 part.
Hydrochloric acid	25 parts.

As an improvement upon this, M. Vogel, jun., places such prints for twenty minutes in a bath composed of—

Water	1000 parts.
Chloro-platinate of potassium	1 part.
Hydrochloric acid	10 parts.

The proofs are then well washed and placed in a solution of bichloride of copper—fifteen per cent.; they are then washed in a solution of alum slightly acidulated with hydrochloric acid. When washed they are ready to be mounted.

DEATH OF LÉONCE ROMMELAERE.

THE premature death of M. Léonce Rommelaere, Director of the Industrial School of Brussels, and first General Secretary of the Belgian Photographic Association, took place last April.

DEATH OF OBERNETTER.

J. B. OBERNETTER died on April 13 from syncope of the heart after a few days' illness. Mr. J. R. Gotz supplies the following concerning the career of a man whose loss we all lament:—J. B. Obernetter was born on May 31, 1840. He studied chemistry at Leipzig in 1858 under Professor Erdmann, and subsequently at Heidelberg under Bunsen, and finally at Munich under Professors H. Pettenkoffer, Liebig, and Kaiser, all more or less great authorities. Upon Liebig's recommendation he devoted himself to photography, and entered the *atelier* of Albert, where he made his first two inventions—enlargements on developing paper and a process of photography on porcelain. Establishing himself in 1863, Obernetter soon produced the well-known collodio-chloride paper a few years later. Upon the suggestion of Albert, his former employer, Obernetter worked out his process of phototype 'Lichtdruck,' which was afterwards bought by Albert and further perfected by both. Obernetter further simplified and perfected it by his dusting-on process with graphite, for which he obtained the gold medal at the Vienna Universal Exhibition. Upon the suggestion of Dr. Maddox for a gelatine instead of a collodion emulsion (1880), Obernetter worked out and soon produced a gelatine emulsion, which still enjoys an unequalled reputation. His gelatine emulsion paper, produced some time later, has also gained a great reputation already, and is only surpassed as an invention by his yet more important work, the production of an orthochromatic plate for landscape work applicable without the yellow screen. Last, not least, is to be mentioned his invention of a process of photo-copper printing by direct transfer of the image from the negative to the copperplate.

THE DEATH OF M. LEMERCIER.

Le Moniteur de la Photographie announced last June the death of M. Lemercier, whose name has long been connected with photography. He purchased the patents of Poitevin and of Albert, of Munich, and in his workshops the first important works by photo-mechanical processes in France were printed.

DEATH OF M. BAYARD.

ONE of the fathers of photography in France, M. H. Bayard, has died at the advanced age of eighty-one. It is stated that he obtained photographs in the camera in 1838.

BIBLIOGRAPHY OF THE YEAR.

THE following is a list of works on photography which have been placed on the editorial table of THE BRITISH JOURNAL OF PHOTOGRAPHY during the year:—

Photographic Printing Methods (Burbank); *Practical Amateur Photography* (Vevers); *Photographic Times Annual; Choice and Use of Lenses* (Dallmeyer); *Instantaneous Photography* (C. W.); *A B C of Photography* (London Stereoscopic Company); *Three Weeks in Norfolk* (Clarke); *Photography of Bacteria* (Crookshank); *Hughes's Principles and Practice of Photography* (Werge); *Guide to Photo-micrography* (Bousfield); *First Handbook in Photography* (Ellerbeck); *How to be a Successful Photographer* (Lancaster); *The Ferrotype and How to Make It* (Estabrooke); *The Magic Lantern and its Applications* (Laudy); *Pictures from Life in Field and Fen* (Emerson); *A B C Guide to Permanent Photography* (Sawyer); *Practical Guide to Photography* (Marion).

USEFUL RECEIPTS.

Mounting Prints in Optical Contact with Glass.—Apply a warm fifty-grain solution of gelatine to the face of the print, and immediately lay it face down upon the glass, applying a squeegee to ensure contact and freedom from air bubbles.

To Bleach Engravings.—Immerse the prints for one minute in Javelle water, and then wash thoroughly in water containing a little hyposulphite of soda. To prepare the Javelle water take four pounds of bicarbonate of soda and one pound of chloride of lime, put the soda in a kettle over the fire, add one gallon of boiling water, let it boil from ten to fifteen minutes, then stir in the chloride of lime, avoiding lumps. When cold the liquid can be kept in a jug or bottle ready for use.

To Make Ink for Labels that will not be Affected by Acids.—Make a mixture of one part pure Trinidad asphaltum, with four parts of oil of turpentine, coloured with plumbago.

To Clean Paint Brushes.—When a paint brush is stiff and hard through drying with paint on it, put some turpentine in a shallow dish and set on fire. Let it burn for a minute until hot, then smother the flame and work the pencil in the fingers, dipping it frequently into hot spirits. Rinse all paint brushes, pencils, &c., in turpentine, grease with a mixture of sweet oil and tallow, to prevent them from drying hard, and put them away in a close box.

To Make Water Colours Flow on a Photograph.—The greasy surface of an albumenised print not unfrequently repels water colours when applied to them. While prepared ox-gall will ensure their smooth flowing, one of the simplest and best methods of treating the print is to apply the tongue to the surface. After this dries the colours will afterwards 'take' to the surface and flow evenly.

To Reduce Over-Printed Proofs.—Immerse the prints in a solution composed of five grains of cyanide of potassium and five drops of liquor ammonia to a pint of water. Allow them to remain until a sufficient degree of reduction has been effected and then wash carefully.

To Identify Silver Chloride from Silver Cyanide.—In a mixture of silver cyanide and silver chloride, both constituents may be identified in the following way: If a particle of silver cyanide be examined by the microscope with a quarter-inch objective, it appears as an amorphous mass; but if a drop of ammonia be placed upon it and very gently warmed it will form distinct needle-like crystals. Silver chloride treated in the same way gives very minute octahedra.

To Remove Pyro Stains.—Silver stains are so rare that they may be looked upon almost as things of the past; but, as every practical photographer is aware, pyro without silver brings stains of a very disagreeably persistent nature. They are, however, quickly removed by moistening the hands with a dilute solution of almost any acid—hydrochloric, nitric,

oxalic, citric, &c. It must be observed, though, that after cleansing the hands in this manner they must be very freely washed in water, preferably hot, for if this precaution be not taken the stains may reappear under the use of soap and water.

To Blacken the Brass Work of Lenses.—The diaphragms of lenses ought not to be blackened by the dead black varnish which is employed on the cells and the inside of the tube, as it would invariably chip off and produce a worse effect than if left untouched. They ought to be stained, by being first made quite clean and then receiving an application of a solution of nitrate of silver and nitrate of copper, heat being then applied.

To Clean Slimy Sponges.—Dissolve one ounce of fused chloride of calcium in eight ounces of water. Wet the sponge, then submerge it in the solution until the slimy substance disappears, after which wash in plain water.

Removal of Oil Stains.—Mix pipe-clay or fullers' earth with cold water to a paste, and apply some of it to the soiled spot, without friction, so as not to injure the design. After having remained there for about twelve hours, it is removed and the remains brushed off. The porous material, after the water has evaporated, soaks up at least a portion of the oil. If the stain does not disappear by one application, it is to be repeated.

To Dry a Gelatine Negative Quickly.—After being fixed and well washed lay the negative, face up, on a sheet of blotting-paper, and covering it with another sheet of blotting-paper, rub the hand all over the surface until the negative is surface dry. Then place it in a current of air for a few minutes. A cambric handkerchief or soft towel will answer instead of blotting-paper. If the negative be immersed in alcohol it will absorb and displace the water in the film, and thus permit of a quick drying by the agency of heat if necessary.

Removing Rust from a Lens.—A lens sometimes acquires a brown, rusty stain on the surface, which no amount of rubbing or cleaning will remove. By applying a paste composed of putty powder and water to the stains, and then rubbing briskly with either the point of the finger or the side of the hand, every spot of rust or stain will be removed in a few minutes. This applies to photographic or other lenses, except the object glass of a telescope, which would be irreparably damaged by such treatment.

To Prepare an Illustration for the Lantern.—A lecturer may prepare a diagram in a few minutes by coating thin glass or mica with benzole varnish to which a few drops of indiarubber solution has been added. This dries transparent, but allows of the finest writing being made on it by means of a steel pen and India ink. By placing it upon an engraving the leading features may be quickly and accurately traced in outline.

Magic Photographs.—Print on paper in the usual way, and fix, without toning. Wash and place in a saturated solution of bichloride of mercury, by which the picture will be rendered invisible. Wash and keep in a portfolio. To develop, immerse in a solution of hyposulphite of soda, or apply a sponge made wet with this solution. Much fun may be created by magic photographs.

Frosting Stereoscopic Transparencies.—Dissolve thirty grains of wax in a fluid ounce of chloroform, and pour over the surface of the transparency. The solvent will evaporate almost immediately, but the full effect is only obtained after the plate has been allowed to stand for eight or ten hours.

To Strengthen Alcohol.—Pour it into a clear glass bottle, and add a tablespoonful of finely-powdered and well-dried carbonate of potash. Now cork the bottle and shake well up for a couple of minutes. Allow to settle, and in a few minutes the water which was mixed with the alcohol will be found at the bottom, united with a portion of the potash, the superfluous portion of which will also be precipitated, leaving the alcohol clear and strong.

Dissolving Shellac in Ammonia.—Place the vessel containing the lac into a larger vessel with hot water. Pour boiling water on the lac, after which add ammonia, slowly, but continuously, stirring all the while with a glass rod until solution is effected. Excess of ammonia colours the solution brown.

Paraffin Lamps for the Developing Room.— The upper part of a paraffin oil lamp after standing for a short time frequently gets oily from the condensation of the vapour of the oil. This may be prevented by taking a piece of felt and cutting a hole in it so as to fit exactly round the socket into which the burner is screwed; trim the felt off so as to leave a rim about half an inch wide, and place this felt ring on the socket.

Freezing Mixture.—While the simplest and most economical freezing mixture consists in dissolving one ounce of nitrate of ammonia in an ounce of water, a far more powerful one consists in adding to the foregoing carbonate of soda, the soda, ammonia, and water, being in equal parts. But in this latter case the nitrate of ammonia cannot be recovered, whereas in the former case it can. When access to snow or powdered ice is had, while the simplest mixture is two parts of either of these and one part of common salt, the most efficacious mixture consists of twelve parts of snow or ice, five parts of nitrate of ammonia and five parts of common salt. These will cause a thermometer to sink twenty-five degrees below zero (Fahr.).

To Test Gold or Silver.—Make the surface of the metal quite clean, by scraping or otherwise, and touch it with a solution of nitrate of silver. If the metal is unaffected and remains uncoloured, it may be assumed to be either gold or silver; if it blackens immediately, it proves it to be brass or metal of the baser order.

Small Lantern Screens.—Nothing forms a much better lantern screen than a sheet of pure white paper, when the screen is of small dimensions, such as those generally used in the drawing-room. A thick and strong paper, well suited to the purpose, is sold by most artists' colourmen. It is known technically as continuous cartridge or drawing paper; it is four feet six or five feet wide, and may be had of any desired length. The price is about eightpence or tenpence a yard for the thickest kind, which is the one that should be employed. A couple of yards of this paper, cemented at one end to a common blind roller and the other to a lath, forms one of the most efficient lantern screens that can be had,

while its cost is but a mere bagatelle. When out of use it is rolled up, and then takes but little room, and will be always ready at a moment's notice.

To Remove a Cork from the Inside of a Bottle.—With a stout string projected into the bottle, turn the bottle around until the cork is caught in a loop of the string, and with force pull out the cork.

To Flatten Curled Prints.—Lay the photograph face down upon a pad composed of several sheets of paper, and place upon it at the left-hand margin a straight and rather sharp edge of a smooth ivory or box-wood rule. Move the rule slowly to the right, and with the left hand raise up the margin of the print nearest to that hand, pulling up rather strongly, yet so as not to allow the print to drag over the pad upon which it is laid. This will flatten the print and remove any further tendency to curl.

Marine Glue.—1. Dissolve by heat one part of pure indiarubber in naphtha, when melted, add two parts shellac; melt until mixed, pour while hot on metal plates to cool. When required to use melt and apply with a brush. 2. Caoutchouc twenty grains, chloroform two fluid ounces, dissolve and add four drachms of powdered mastic, let it macerate for a week; must be kept cool and well corked.

Portable or Mouth Glue.—Fine pale glue one pound, dissolve over a water bath in sufficient water, add brown sugar quarter of a pound, continue the heat till amalgamation is effected; pour on a slab of slate or marble, and, when cold, cut into squares.

Delicate Test for Hyposulphite in Card Mounts.—Cut three or four square inches of the suspected card into small pieces and place in a beaker with a few scraps of granulated zinc; fill half full of water, and add about half a drachm of sulphuric acid. *Quickly* cover the beaker with a round piece of filtering paper, bending it under the edges of the beaker, and let fall a drop or two of a solution of sugar of lead upon the filtering paper. Set it aside for half an hour, and if there has been any hyposulphite in the paper the sugar-of-lead solution will have left a brown stain. This test shows the presence of an infinitesimal portion of hyposulphite. The more of it that is present the quicker is the stain produced.

Varnish for Restoring Whitened German Gold Frames.—Reduce thirty grains of gamboge and half an ounce of dragon's blood to coarse powder, and add to thirty grains of turmeric powder, and two and a half ounces each of shellac and sandarac. Place in a bottle with a pint of turpentine, and, keeping it in a warm place for fourteen days, shake at intervals. Filter, and add four ounces of mastic varnish. This is to be applied with a brush to metal-coated frames.

Halation.—A quick drying coating, which is applied to the back of the plate, consists of collodion, with which any dark red or brown pigment is mixed. Spanish brown or rouge answers well.

Varnish Making.—The basis of white-hard varnish is generally understood to be sandarac, and that of brown-hard shellac. It frequently happens, in diluting either variety with methylated spirit, that a turbidity is caused owing to a slight precipitation of a portion of the resin. This may arise from the spirit not being strong enough. Should this, however, not be the cause, the turbidity may generally be removed by the addition of a small quantity of turpentine.

To Remove a Collodion Film from Glass.—Place the plate in a vessel of water very strongly acidulated with sulphuric or other acid which has no action on the silver image, and the film will speedily become loosened and float off.

Dry Pocket Glue.—Dry pocket glue is made from twelve parts of glue and five parts of sugar. The glue is boiled until entirely dissolved, the sugar dissolved in the hot glue, and the mass evaporated until it hardens on cooling. The hard substance dissolves rapidly in lukewarm water, and is an excellent glue for use on paper.

To Deposit Gold upon Steel.—Make a solution of chloride of gold, the strength being immaterial, provided it be not too weak. We have always preferred having as little water as possible. Into this solution pour sulphuric ether, and, having replaced the stopper of the bottle, shake the mixture well up, when it will be found that the gold has left the water and entered into combination with the ether. Upon immersing a piece of bright polished steel—such as the blade of a knife—in this, it will instantly become coated with metallic gold.

Removing Greasiness from Prints.—It is frequently the case that when water colours are to be applied to a print on albumenised paper, there is such a greasy repellent action set up as to prevent this from being done. This tendency may be entirely cured by applying the tongue to the surface of the print.

To Prepare Ox-gall for Artistic or Scientific Purposes.—Procure from a butcher half a pint of ox-gall. Place this in a clean saucepan and add an ounce of powdered alum and an ounce of common salt. Place over the fire, and when it boils remove for half an hour to cool; then boil again, and repeat this boiling and cooling for three or four times. After this allow it to settle for three or four hours, and decant off into a bottle, in which put two or three drops of essence of lemon. Cork and preserve for use.

Uses of a Squeegee.—The squeegee is a simple tool which, considering its general utility, does not find a place in nearly so many photographic workrooms as it deserves. If a plate of glass or metal, for example, has to be dried, a single stroke of this useful appliance will do it in an instant. If a solution or water be spilt on a table or bench it can be more effectually removed by one or two strokes with the squeegee than by a far more lengthy operation with cloths. For quickly removing hyposulphite from large prints it has no equal. Those who make it a practice to have a squeegee always at hand ready for the thousand and one purposes to which it may be applied, are the ones best qualified to speak as to its efficacy.

To Recover Silver Bromide from Waste Emulsion.—Let the emulsion be melted, and then add a small quantity of hydrochloric acid, following by boiling for two or three minutes. The silver bromide precipitates, and the destroyed gelatine is then poured off. The bromide is then placed among the other residues for reduction.

Artificial Ivory for Photographs.—One of several methods of making artificial ivory slabs for portraits consists in mixing together sulphate of baryta with gelatine or albumen, compressing the product into sheets and drying it.

Reducing the Intensity of Negatives.—To reduce a negative on either paper or glass, place it in a weak solution of ferricyanide of potassium and hyposulphite of soda—say, three grains of the former to an ounce of a five per cent. solution of hypo, the solution being freshly prepared.

Glazing Gelatine Prints.—The use of highly hand-polished sheet vulcanite rubber for imparting a high gloss to the surface of gelatino-bromide prints is now well known, but, in consequence of the difficulty in obtaining good samples, and of its high cost, the general use of it has been somewhat limited. A substitute, in the shape of ferrotype plates, costing but a mere fraction of the rubber, has been recently tried with success. Upon the smooth, varnished side of the sheet is laid the moist print, film side down. It is then squeegeed by passing a rubber roller over the back, which presses out all the air bells. In an hour or so the print, when dry, can be pulled off at one corner, and will possess a high gloss. A slight heat applied on the rough side of the metal sheet will materially hasten the drying.—*Scientific American.*

Collodion for Decayed Teeth.—If ten parts of collodion are added to fifteen parts of creosote a sort of jelly is obtained which is more convenient to apply to decayed teeth than creosote in the liquid form.

Rice Glue.—Mix rice flour with cold water, and gently simmer it over the fire, when it readily forms a delicate and durable glue.

To Make Paper Waterproof.—Make a strong solution of Castile soap, and with it paint the paper or other material that is to be waterproofed. When nearly dry, paint it over again with a strong solution of chrome alum.

To Clean Paraffin Developing Lamps.—Wash the lamp inside and out thoroughly with hot water and soap and a little washing soda. When clean, rinse repeatedly so as to leave no trace of soap ; let it drain till dry.

Ink Stains on Prints or Books.—These may, in the majority of cases, be removed by applying a solution of muriatic acid, oxalic acid, or salt of sorrel (binoxalate of potash). After the stains disappear wash very thoroughly in water, and dry.

Delicate Test for Hyposulphites.—In the solution to be tested place either pure zinc or aluminium wire, add dilute hydrochloric or sulphuric acid ; warm slightly, and test with lead paper, which, if hyposulphite be present, will blacken in five minutes.

Packing Wet Plates.—A good way of packing plates, whether wet or dry, so as to preserve their films from danger, even if wet, consists in taking a small square of American cloth, cutting out one of the triangles formed by its diagonals, doubling it over and gluing. It is better to make them rather larger than necessary, and then cut them to the required size.

To Separate Gelatine Films from Glass.—This may be done by immersing the negative for some time in greatly diluted hydrofluoric or hydrochloric acid. To ensure success, the negative should be treated with chrome alum, then washed and dried before the application of the acid.

Preparation of Bitumen for Etching.—To make a solution of bitumen suitable for etching purposes, coarsely powder the bitumen and place it in a bottle, add benzole and well shake several times during the day; allow it to stand for two or three days and then decant the clear portion. This must afterwards be diluted to the strength required. As different samples of bitumen vary in solubility, no definite strength of solution can be given. It must be so dilute, however, that when it is dry on the plate it only forms a very attenuated film.

To Identify a Criminal by Photography.—Take a sharp photograph of the palm of one hand, placed in a strong oblique light, so as to bring out the markings forcibly. This gives a map which is never alike in two persons, and which no disguise short of actual disfigurement could do away with.

Useful Paste.—Place five pounds of potato starch in six pounds of water, and add one quarter pound of pure nitric acid. Keep it in a warm place, stirring frequently for forty-eight hours. Then boil the mixture until it forms a thick and translucent substance. Dilute with water, if necessary, and filter through a thick cloth. At the same time, another paste is made from sugar and gum arabic. Dissolve five pounds gum arabic and one pound of sugar in five pounds of water, and add one ounce of nitric acid and heat to boiling. Then mix the above with the starch paste. The resultant paste is liquid, does not mould, and dries on paper with a gloss. It may be employed for every purpose in photography except mounting silver prints.

Cement (Opticians').—Resin, one pound; melt, and add dry plaster of Paris, four ounces.

To Prepare a Negative for Retouching.—Mix as follows:—

Gum dammar	6 grains.
Turpentine (rectified)	1 ounce.

When dissolved, filter through absorptive cotton, and apply this to the film all over with a piece of washleather. This medium is also very good used after varnishing as an ordinary retouching medium. A weak solution of resin in turpentine (about fifteen grains to the ounce) will also answer well.

A Quick Filter.—Take a clear piece of chamois-skin, free from thin places, cut it of the desired size, wash it in a weak solution of soda or any alkali to remove the grease, and rinse thoroughly in cold water before using. Tinctures, elixirs, syrups, and even mucilages are filtered rapidly. A pint of the thickest syrup will run through in four or five minutes. By washing thoroughly after each time of using it will last a long time.

To Make Sulphide of Potassium.—This compound, known popularly as 'liver of sulphur,' may be prepared by fusing together one part of sulphur and four parts of carbonate of potash. When cold, the mass should be broken up and kept in a wide-mouthed, corked bottle. Its photographic uses are too well known to require mention here.

Non-actinic Colour.—Paper or cloth may be dyed a non-actinic colour by impregnating it with six ounces of acetate of lead in twelve ounces of water. After drying, it is placed in a solution of three ounces of bichromate of potash in two quarts of water. It is then rinsed and dried, and if a deeper colour be desired the operation may be repeated.

Toning Collodion Transparencies.—Immerse them in a weak solution of sulphide of potassium.

To Ascertain the Strength of a Silver Solution.—If the solution contain nothing but nitrate of silver then may the argento-hydrometer be employed in the certainty of its affording a fairly accurate idea of the number of grains of the salt contained in each ounce of water. But this specific-gravity test quite fails in the case of a silver solution which, from having been long in use, contains other matters. In this case a test solution composed of pure chloride of sodium eight and a half grains, dissolved in six ounces of distilled water, must be prepared. To use it, place one drachm of the bath solution in a two-ounce bottle, rinsing out the minim measure with a drachm of distilled water and adding to the other. Pour in the salt solution slowly and with occasional shaking until no further precipitate takes place. Having noted how many drachms it has taken to effect this end, multiply this number by four for the weight in grains of the nitrate of silver present in an ounce of the bath solution. If pure chloride of sodium be not procurable, commercial chloride of ammonia may be substituted, seven and three-quarter grains being dissolved in six ounces of water.

To Preserve Gum Water.—After dissolving gum arabic in warm water to any strength desired, add to it a small lump of camphor. This prevents it from becoming sour.

To Make Starch Paste keep Good for Several Days.—Starch, one drachm; water, one ounce. Mix and heat over boiling water till turned, then add half a drachm of glycerine.

To Make Tracing Paper.—Brush tissue-paper over with a mixture of equal parts of mastic varnish and oil of turpentine, and hang up to dry. Canada balsam thinned by turpentine also serves the purpose.

Bookbinders' Paste.—Place half a quartern of flour in a saucepan, put as much cold water on it as will cover it, and stir it well up, so as to break all the lumps while in a state of dough. Then pour about two quarts of cold water and one ounce of powdered alum. Stir well, and boil till it is thick.

India Ink for drawing may be improved so that even the thickest lines will quickly dry, by adding one part of carbolic acid to eight of the India ink. If too much is added it may be rectified by putting in more India ink. If the mixture is properly formed the ink is as easy to draw with as it is without carbolic acid, but dries quickly, and may even be varnished without discharging.

To Prevent Unmounted Prints from Curling.—It is stated that this end may be effected by immersing the proofs in the following solution after their last washing:—

Water	1 part.
Alcohol	4 parts.
Glycerine	3 ,,

Test for Nitric Acid.—The ever-useful pyrogallic acid has been put to a new purpose, a test for nitric acid, and it is stated to be capable of detecting it in water when present in so small a proportion as one in ten million parts. A small quantity (half a grain to the ounce) is dissolved

in the water to be tested, and ten or twelve drops of strong sulphuric acid allowed to trickle down the side of the test-tube so as to form two layers; at their surface of contact a brown or yellow coloration is produced if nitric acid be present.

To Convert Photographs into Line Drawings.—There are two methods by which a photograph can be prepared for the purpose referred to. The first consists in printing the photograph in the usual way on either plain or albumenised paper and fixing it, care being taken not to tone it with gold. When washed and dried the image is of a brown colour. This must be gone over with a steel pen charged with very black ink, so as to ensure the chief features in the photograph being translated into lines more or less thick. When the drawing is completed the paper is floated upon a solution of bichloride of mercury, by which the photograph disappears in consequence of its bleaching, leaving the ink lines. From this drawing a negative is made. The second method consists in sensitising the paper by sponging it over with ammonio-oxalate or citrate of iron, exposing under the negative, and developing with a wash of potassium ferrid-cyanide. This gives an image, in a blue colour, which does not require to be removed in the after-process of producing a negative from the pen-and-ink drawing.

To Measure the Angle of View included on a Plate.—Having spread on a table a large sheet of paper, draw on it a straight line equal to the length of the plate that is to be used, eight inches for an 8×5 plate, ten inches for a 10×8 plate, and so forth. Now, from the centre of this line erect a vertical line a little longer than the focus of the longest of the series of lenses that are to be subjected to this examination. With a foot-rule measure off from the base line the focus of the lens, and put a mark on the vertical line, and then with a pencil draw lines from this mark to each end of the base line first made. If there are more lenses than one to be thus determined, then let this measurement on the central line, followed by the extension lines to the ends of the base line, be made in every case, and each angle thus made by the pencil will represent the angle of view included on the plate by that particular lens which was instrumental in having such angular markings effected. To *measure* the angles thus obtained, place a protractor so that its centre or zero coincides with that mark on the vertical line upon the sheet of paper, and note where the diverging pencil lines touch the scale on either side, and enter the figures in the note-book as the angular covering power of that lens on that size of plate.

Permanent Solution of Iodide of Starch.—The use of iodide of starch puts into our power one of the most sensitive reagents known to chemists; by its means the merest trace of hypo can be shown. A method has lately been described, by means of which a permanent solution of starch potassium iodide can be kept ready. Five parts of starch ground up with about fifty of water are well shaken up in a flask, and, next, about twenty-five parts of a solution of potash (one part potash to two of water) added. The whole is well shaken, and it then forms a gelatinous mass. Five hundred parts of water are now added and two of potassium iodide, and the whole is heated to boiling, shaking frequently, when the solution becomes clear. The liquid is then allowed to cool, and is finally filtered.

To Print in a Background.—Employ a light background in taking the portrait, so that when printed it appears on a plain and slightly toned paper. The figure is then painted over with some non-actinic water colour—gamboge, for example—so as to protect it from light in the second printing. When the colour is dry, the print is exposed behind a landscape negative, care being taken that it is not deeply printed. In washing the print prior to toning the colour is removed, leaving the paper perfectly clean.

Freckles.—These, especially in summer, cause portrait photographers much trouble, for they are invariably more pronounced in the negative than on the face of the sitter. They may be mitigated in a considerable degree by bathing the face in very warm water immediately before sitting. A still more successful way to prevent their appearance on the negative is to get the sitter to apply puff powder of a yellow colour to his or her face. Common violet powder will answer if with it be mixed any harmless yellow powder. Freckles are *said* to be removed by a mixture of three grains of borax in five drachms each of rose water and orange-flower water, applied every night; but we do not believe that it will prove efficacious even if the application were carried on for years.

Waterproof Paper.—Dissolve eight ounces of alum and three and three-quarters ounces of Castile soap in four pints of water, and two ounces of gum arabic and four ounces of blue, separately, in four pints of water. Mix the solutions, heat slightly, dip in the single sheets, and hang up to dry.

To Cement Lenses.—Although I never recommend photographers to meddle more with their lenses than they can help, yet in some, especially those of foreign make, an arborescent appearance is occasionally to be seen between the elementary parts of which the lens is composed. This arises from the drying or shrinking of the balsam with which it is cemented. To remedy this, unset the lens, place it in warm water, which may be still further heated till the balsam softens, separate the components, and clean with ether, benzole, or turpentine. Next place a drop of pure balsam on the centre of the concave surface, and gently press the convex one down upon it until the balsam spreads and oozes out at the edges. Then apply a gentle heat until the balsam is found to have been hardened.

Removal of Ink Stains from Photographs.—Much, of course, depends upon the nature of the ink by which the stains were produced; but, assuming it to be the time-honoured gallate of iron ink, dissolve a drachm of oxalic acid in an ounce of warm water, and having wetted the surface of the print with warm water, apply the solution to the spot and rub gently until it disappears. Keep it warm throughout. Wash thoroughly and dry.

Another Method.—These may be removed by applying hydrochloric. If the photograph has been properly toned it will sustain no damage.

Polishing Brass.—For polishing brass, rub the surface with rottenstone and sweet oil, then rub off with cotton flannel, and polish with soft leather. A solution of oxalic acid rubbed over tarnished brass soon renders the metal bright. Wash off the acid with water, and rub the brass with whiting and soft leather.

To Secure Labels on Bottles.—After the label has been pasted on, give it one or two coats of ordinary negative varnish or of shellac varnish. This will ensure it against being acted on by moisture.

Restoring Discoloured Negatives.—When the varnish of a negative becomes discoloured from long use and exposure, and the printing qualities become consequently impaired, lay it down, face up, in a flat dish, and pour over it some alcohol, waving it backwards and forwards over the plate by gentle tilting. In two or three minutes the varnish will be removed. Wash with fresh alcohol, dry, and revarnish.

To Bleach Discoloured Prints.—The soiled paper, print, or engraving, is to be first placed in a bath composed of a quarter of a pound of chloride of lime, and the same of soda, to about a quart of water, and allowed to remain till the paper has regained its proper tint. Next, it is removed with the utmost care into a dish of cold running water, and allowed to remain for at least six hours—the chloride of lime being by that time removed. When the paper is thoroughly dry by exposure, it must be dipped into a third bath c. size and water, which will restore its firmness. Finally it is placed between printers' glazed-boards and passed through a press, which will restore the original smooth surface, in which condition it will be suitable for photographing. If prints are stained by oil, grease, coffee, candle drippings, or ink, different treatment will be needed. Hydrochloric acid, diluted with five times its bulk of water, forms the first bath, and into it the engraving is placed, for not longer than four minutes, and then carefully washed as above. A grease spot is to be removed by placing the sheet between two pieces of blotting-paper, or covering with powdered talc, and applying a heated iron to the spot, which will melt the grease and cause it to be at once soaked up by the porous paper. Dirty finger-marks are to be removed by covering them over with a piece of clean yellow soap for two or three hours, and then washing with a sponge and hot water. The sheet is afterwards dipped in weak acid and water, followed by another hot-water bath, and ultimately by cold water. Ink stains are to be destroyed by dipping the paper into a strong solution of oxalic acid, and then into one of hydrochloric acid and water (one to six); finally, the usual continuous cold bath.

Dead Black Varnish.—Take two grains of lampblack, put it into any smooth, shallow dish, such as a saucer or small butter-plate, add a little gold size, and thoroughly mix the two together. Just enough gold size should be used as will hold the lampblack together: about three drops, of such size as may be had by dipping the point of a lead-pencil about half an inch into the gold size, will be found right for the above quantity of lampblack; it should be added a drop at a time, however. After the lampblack and size are thoroughly mixed and worked, add twenty-four drops of turpentine, and again mix and work. It is then ready for use. Apply it thin with a camel-hair brush, and when it is dry the articles will have as fine a dead black as when they came from the optician's hands.

For Contents, *see p.* 565.

For Formulæ, *see p.* 517.

For Index to Advertisers, *see p.* 583.

For Postal and Telegraphic Addresses, *see p.* 688.

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FORMULÆ.

THE WET COLLODION PROCESS.

Iodised Collodion (for Negatives).

Ether, s.g. ·725	10 fluid ounces.
Alcohol, s.g. ·805	8 ,,
Pyroxyline	120 grains.
Iodide of ammonium	12 ,,
,, cadmium	20 ,,

Bromo-Iodised Collodion (for Negatives).

Ether, s.g. ·725	10 fluid ounces.
Alcohol, s.g. ·805	10 ,,
Pyroxyline	120 grains.
Iodide of ammonium	40 ,,
,, cadmium	40 ,,
Bromide of ,,	20 ,,

Bromo-Iodised Collodion (for Positives or Ferrotypes).

Ether, s.g. ·725	10 fluid ounces.
Alcohol, s.g. ·805	10 ,,
Pyroxyline	100 grains.
Iodide of cadmium	50 ,,
Bromide of ammonium	20 ,,

THE NITRATE BATH (for Negatives).

Nitrate of silver (recrystallised)	6 ounces.
Distilled water	80 fluid ounces.
Nitric acid (pure)................................	10 minims.

Saturate with iodide of silver and filter.

(For Positives or Ferrotypes).

Nitrate of silver (recrystallised)	5 ounces.
Distilled water	80 fluid ounces.
Nitric acid (pure)................................	12 minims.

Saturate with iodide of silver and filter.

DEVELOPER.

FOR NEGATIVES.

No. 1

Protosulphate of iron	¼ ounce.
Glacial acetic acid	¼ ,,
Alcohol	½ ,,
Water	8 ounces.

No. 2.

Ammonio-sulphate of iron	75 grains.
Glacial acetic acid	75 ,,
Sulphate of copper	7 ,,
Water	3 ounces.

FOR COLLODION POSITIVES OR FERROTYPES.

Protosulphate of iron	1½ ounce.
Nitrate of baryta	1 ,,
Water	1 pint.
Alcohol	1 ounce.
Nitric acid	40 drops.

Photo-print. *Waterlow & Sons Ltd., London.*

"YOU NAUGHTY BOY."

From a negative on a Thomas's "Pall Mall" Plate.

By Mr. J. B. B. Wellington.

For Collodion Transfers.

Pyrogallic acid	5 grains.
Citric acid	3 ,,
Acetic acid	45 minims.
Water	1 ounce.
Alcohol	*quant. suff.*

Intensifying Solution.

A.—Pyrogallic acid	3 grains.
Water	1 ounce.
B.—Nitrate of silver	10 grains.
Citric acid	20 ,,
Acetic acid	1 drachm.
Water	1 ounce.

For use mix a few drops of B with enough of A to cover the surface of the plate.

DRY COLLODION PROCESSES.

PYROXYLINE.

For Collodio-Bromide or Unwashed Emulsion.

Nitric acid, s.g. 1·45	2 fluid ounces.
Sulphuric acid, s.g. 1·845	4 ,,
Water	1 fluid ounce.
Cotton (cleaned and carded)	100 grains.
Temperature	150° Fahr.
Time of immersion	10 minutes.

For Washed Emulsion.

No. 1.

Nitric acid, s.g. 1·45	2 fluid ounces.
Sulphuric acid, s.g. 1·845	6 ,,
Water	1 fluid ounce.
Cotton (cleaned and carded)	100 grains.
Temperature	140° Fahr.
Time of immersion	10 minutes.

No. 2.

Nitric acid, s.g. 1·45	2 fluid ounces.
Sulphuric acid, s.g. 1·845	3 ,,
White blotting-paper	145 grains.
Temperature	100° Fahr.
Time of immersion	30 minutes.

COLLODION.

For Collodio-Bromide.

Ether, s.g. ·720	5 fluid ounces.
Alcohol, s.g. ·820	3 ,,
Pyroxyline	50 grains.
Bromide of cadmium and ammonium	80 ,,
or Bromide of zinc	76 ,,

Sensitise by adding to each ounce fifteen grains of nitrate of silver, dissolved in a few drops of water and one drachm of boiling alcohol. This is suitable for slow landscape work or for transparencies.

* For Washed Emulsion (for Landscapes).

No. 1

Ether, s.g. ·720	4 fluid ounces.
Alcohol, s.g. ·820	2¾ ,,
Pyroxyline	40 grains.
Castile soap (dissolved in alcohol)	30 ,,
Bromide of ammonium and cadmium	84 ,,

Sensitise with one hundred grains of nitrate of silver dissolved in one ounce of boiling alcohol; and after standing ten days, add a further twenty grains of silver dissolved as before in two drachms of alcohol.

* No. 2 (rapid).

Ether, s.g. ·720	4 fluid ounces.
Alcohol, s.g. ·820	2½ ,,
Pyroxyline	40 grains.
Castile soap	30 ,,
Bromide of ammonium and cadmium	56 ,,

Sensitise with 125 grains of nitrate of silver, dissolved, as before, in one ounce of alcohol with the aid of heat. In twelve hours' time add thirty grains more of the double bromide of ammonium and cadmium dissolved in half an ounce of alcohol.

* For Washed Emulsion (for Transparencies).

Ether, s.g. 720	5 fluid ounces.
Alcohol, s.g. ·820	3 ,,
Pyroxyline or papyroxyline	60 grains.
Bromide of cadmium and ammonium	100 ,,
or Bromide of zinc	96 ,,
Hydrochloric acid, s.g. 1·2	8 minims.

Sensitise with twenty grains of nitrate of silver to each ounce, dissolved in a minimum of water with two drachms of boiling alcohol. Allow to stand for two or three days.

* N.B.—In the three last formulæ, the emulsion, after being allowed to ripen for the time stated, should be poured into a dish and allowed to become thoroughly dry. The mass of dry emulsion is then washed, to remove all the soluble salts, and is then again dried and redissolved in equal parts of ether and alcohol, at the rate of from twenty to twenty-four grains to the ounce of solvents.

ORGANIFIERS (for Unwashed Emulsions).

No. 1.

For Landscape Work.

Tannin	½ ounce.
Gallic acid	60 grains.
Water	20 fluid ounces.

No. 2.

Tannin	300 grains.
Water	20 fluid ounces.

No. 3.

For Landscapes or Transparencies (warm brown tone).

Freshly-ground coffee	1 ounce.
Boiling water	1 pint.

No. 4.

For Transparencies (brownish-black tone).

Tannin	30 grains.
Pyrogallic acid	60 ,,
Water	20 fluid ounces.

DEVELOPING SOLUTIONS FOR COLLODION EMULSION.

SOLUTION A.

Pyrogallic acid	96 grains.
Alcohol	1 fluid ounce.

SOLUTION B.

Bromide of potassium	10 grains.
Water	1 fluid ounce.

SOLUTION C.

Liquor ammonia, s.g. ·880	1 fluid drachm.
Water	15 fluid drachms.

OR D.

Carbonate of ammonia	2 grains.
Water	1 fluid ounce.

For each drachm of developer take, for a normal exposure, five minims of A, one or two minims of B, and one or two minims of C, or, if D be used, add the above quantities of A, B, and C, to one drachm of D. When the details of the image are out, add double the quantities of B and C.

INTENSIFYING SOLUTIONS FOR COLLODION EMULSION.

Nitrate of silver	60 grains.
Citric acid	30 ,,
Nitric acid	30 minims.
Water	2 ounces.

To each drachm of a three-grain solution of pyrogallic acid add two or three minims of the above, and apply until sufficient density is attained.

MISCELLANEOUS FORMULÆ.

TO RESTORE FADED NEGATIVES.

Mr. W. E. Debenham recommends the following solution for the purpose of restoring printing force to negatives which have faded after mercurial intensification :—

Schlippe's salt	10 grains.
Water	1 ounce.

Wet the film thoroughly by soaking in a dish of water, and immerse in the restoring solution until the desired effect is obtained.

TO REMOVE THE LAST TRACES OF HYPO FROM THE FILM.

Hydroxyl.

Peroxyde of hydrogen (twenty vols.)	1 drachm.
Water	5 ounces.

After washing the negative well it is immersed for a couple of minutes in the solution and again rinsed in water, when the intensification with silver can be at once proceeded with.

Another.

Where peroxide of hydrogen is not obtainable the following may be used as a substitute, the solution containing that substance in combination with others :—

Barium dioxide	1 ounce.
Glacial acetic acid	1 ,,
Water	4 ounces.

Reduce the barium dioxide to a fine powder and add it gradually to the acid and water, shaking until dissolved. A few minutes' immersion in this solution will effectually remove or destroy the last traces of hypo.

Alum.

A simple plan brought forward by Captain Abney for this specific purpose consists in employing a saturated solution of alum in place of the solution of hydroxyl or peroxide of hydrogen.

Eau de Javelle.

Dry chloride of lime (hypochlorite of lime)	2 ounces.
Carbonate of potash	4 ,,
Water...	40 ,,

Mix the chloride of lime with thirty ounces of the water; dissolve the carbonate of potash in the remainder. Mix, boil, and filter.

Labarraque's Solution.

Chloride of lime	2 ounces.
Carbonate of soda	4 ,,
Water...	40 ,,

Mix the chloride of lime with thirty ounces of the water, and dissolve the carbonate of soda in the remainder. Mix, boil, and filter.

CLEARING SOLUTIONS FOR GELATINE NEGATIVES.

Cowell's.

Alum	2 ounces.
Citric acid..	1 ounce.
Water...	10 ounces.

Wash moderately after fixing, and immerse the negative in the above.

Another.

Saturated solution of alum	20 ounces.
Hydrochloric acid (commercial)	1 ounce.

Immerse the negative after fixing, having previously washed it for two or three minutes under the tap; wash well after removal from the alum and acid.

FERROUS CITRO-OXALATE DEVELOPER.

No. 1.	Potassium citrate	700 grains.
	Potassium oxalate	200 ,,
	Water	3½ ounces.
No. 2.	Ferrous sulphate	300 grains.
	Water	3½ ounces.

Mix in equal parts.

FORMULÆ FOR NEGATIVE VARNISH.

No. 1.

Sandarac	4 ounces.
Alcohol	28 ,,
Oil of lavender	3 ,,
Chloroform	5 drachms.

No. 2.

White hard varnish	15 ounces.
Methylated alcohol	25 ,,

This will be found a good and cheap varnish if durability is not required, as it is easily rubbed up for retouching upon and easily cleaned off. Very suitable for enlarged negatives that are not to be retained.

No. 3.

Tough, hard, and durable :—

Shellac	1¼ ounce.
Mastic	¼ ,,
Oil of turpentine	¼ ,,
Sandarac	1¼ ,,
Venice turpentine	¼ ,,
Camphor	10 grains.
Alcohol	20 fluid ounces.

No. 4.

Sandarac	90 ounces.
Turpentine	36 ,,
Oil of lavender	10 ,,
Alcohol	500 ,,

No. 5.

This one may be rubbed down with powdered resin, and gives a splendid surface for retouching :—

Sandarac	2 ounces.
Seed lac	1 to 1½ ounce.
Castor oil	3 drachms.
Oil of lavender	1½ drachm.
Alcohol	18 fluid ounces.

No. 6.

Best orange shellac	1½ ounce.
Methylated alcohol	1 pint.

Keep in a warm place until dissolved ; then add a large teaspoonful of whiting or prepared chalk ; set aside to clear, and then decant. This is specially recommended for gelatine negatives.

NEGATIVE RETOUCHING VARNISH.

Sandarac	1 ounce.
Castor oil	80 grains.
Alcohol	6 ounces.

First dissolve the sandarac in the alcohol, and then add the oil.

GROUND-GLASS VARNISH.

Sandarac	90 grains.
Mastic	20 ,,
Ether	2 ounces.
Benzole	½ to 1½ ounce.

The proportion of the benzole added determines the nature of the matt obtained.

PRINTING FORMULÆ.

SELECTED TONING FORMULÆ.

No. 1.

Chloride of gold	1 grain.
Acetate of soda	30 grains.
Water	8 ounces.

This must not be used till one day after preparation. It keeps well, and gives warm, rich tones.

No. 2.

Chloride of gold	1 grain.
Bicarbonate of soda	4 grains.
Water	8 ounces.

This is ready for immediate use after preparation, but it will not keep.

No. 3.

Chloride of gold	1 grain.
Phosphate of soda	20 grains.
Water	8 ounces.

This gives rich tones of a deep purple nature, but must be used soon after preparation.

No. 4.

Gold solution	10 drachms.
Acetate of lime	20 grains.
Chloride of lime	1 grain.
Tepid water	20 ounces.

The 'gold solution' before mentioned is prepared by neutralising as much as is required of a one-grain solution of chloride of gold by shaking it up with a little prepared chalk, then allowing it to settle, and filtering off the clear liquid. This toning bath improves by keeping. To use, add two ounces of it to eight ounces of tepid water, which will prove sufficient to tone a full-sized sheet of paper.

No. 5.

Chloride of gold	15 grains.
Water	5 ounces.

Neutralise with lime water, make up to fifteen ounces with water, and add two drachms of chloride of calcium. This stock solution will keep for a long time for use. Dilute one ounce with ten ounces of water.

No. 6.

Toning and Fixing in One Bath.

Chloride of gold	1 grain.
Phosphate of soda	15 grains.
Sulphocyanide of ammonium	25 ,,
Hyposulphite of soda	240 ,,
Water	2 ounces.

Dissolve the gold separately in a small quantity of water, and add it to the other solution.

SOLUTION FOR MOUNTING PRINTS WITHOUT THEIR COCKLING.

Nelson's No. 1 photographic gelatine	4 ounces.
Water	16 ,,
Glycerine	1 ounce.
Methylated alcohol	5 ounces.

Dissolve the gelatine in the water, then add the glycerine, and lastly the spirit.

ENCAUSTIC PASTE.

Pure wax	500 parts.
Gum elemi	10 ,,
Benzole	200 ,,
Essence of lavender	300 ,,
Oil of spike	15 ,,

SENSITISING SOLUTION FOR CARBON TISSUE.

Bichromate of potash	1 ounce.
Water	20 ounces.
Liquor ammonia	6 minims.

WAXING SOLUTION.

For Carbon Prints, or for Removing Collodion Films.

No. 1.

Beeswax	20 grains.
Benzole rect. No. 1	4 ounces.

For Flexible Supports (Autotype).

No. 2.

Yellow resin	3 drachms.
Yellow beeswax	1 drachm.
Rectified spirits of turpentine	10 ounces.

THE 'DUSTING-ON' PROCESS.

No. 1.

Saturated solution of bichromate of ammonia	5 drachms.
Honey	3 ,,
Albumen	3 ,,
Distilled water	20 to 30 ,,

No. 2.

Dextrine	½ ounce.
Grape sugar	½ ,,
Bichromate	½ ,,
Water	½ pint.

No. 3.

Gum arabic	6 parts.
Bichromate of potash	2·5 ,,
Grape sugar	4 ,,
Water	72 ,,

No. 4.

Honey	4 drachms.
Glucose	8 ,,
Albumen	6 ,,
Dextrine	3 ,,
Bichromate of potash	8 ,,
Water	20 ounces.

TONING BATH FOR GELATINO-CHLORIDE PRINTS.

A.

Water	3 ounces.
Chloride of gold	2 grains.

B.

Water	3 ounces.
Sulphocyanide of ammonium	40 grains.
Hyposulphite of soda	1 grain.
Carbonate of soda	3 grains.

These are mixed together by one part of A being poured into an equal part of B; in no case the reverse.

DEVELOPERS.

WOLLASTON'S DEVELOPER FOR PAPER NEGATIVES.

No. 1.

Sodic sulphite, *pure*	8 ounces.
Hot distilled water	40 ,, (fluid).

Let cool to 60° Fahr., and render *just* acid with citric. Test with litmus. Pour on to 1 ounce (437½ grains) pyro.

No. 2.

Sodic carbonate, *pure*	4 ounces.
Potassic ,, ,,	1 ounce.
Distilled water	40 ounces (fluid).

Mix equal parts No. 1 and No. 2 for normal exposures.

Always have a ten per cent. solution of bromide at hand for emergencies, and use if great opacity is desired, but as a rule no restrainer is necessary.

It is sometimes desirable to proceed with caution, and add a portion only of the No. 2 solution at the outset, and when time is not of much importance it is better further to dilute the mixed developer with one-third to one-half its bulk of water. Push the development further than seems necessary.

BŒLTE'S DEVELOPER.

A.

Distilled boiling water	500 parts.
Sulphite soda	100 ,,
Citric acid	8 ,,
Pyro	15 ,,

B.

Distilled boiling water	500	parts.
Carbonate soda	25	,,
Carbonate potash	25	,,

To develop, take of A, one part; B, one part; water, one part.

STANDARD DEVELOPER OF NEW YORK AMATEUR SOCIETY.

No. 1.

Water	32	ounces.
Yellow prussiate of potash	3	,,
Carbonate of soda	3	,,
Carbonate of potash	3	,,

No. 2.

Water	32	ounces.
Sulphite of soda	3	,,

To one and three-quarter ounces of No. 2 add a quarter of an ounce of No. 1 and four grains of dry pyro.

EDER'S OXALATE DEVELOPER.

Neutral oxalate of potash	2 ounces.
Sulphate of iron	6 drachms.
Water	3½ ounces.

Neutral oxalate of potash is dissolved in boiling water, and this solution is kept at a temperature between 194° and 203° Fahr., while sulphate of iron is dissolved in it. It is then set aside for twenty-four hours, and the clear liquid decanted off the crystals that have formed at the bottom, and is ready for use.

BEACH'S DEVELOPER (LATEST).

No. 1.—Pyro Solution.

Sulphite soda (chem. pure crystals)	4 ounces.
Warm distilled or melted ice water	4 ,,

When cooled to 70° Fahr., add

Sulphurous acid water (strongest to be had) ...	3½ ounces.

And, lastly,

Pyrogallol	1 ounce.

No. 2.—Potash Solution.

A	Carbonate potash (chem. pure)	3 ounces.
	Water	4 ,,
B	Sulphite soda (chem. pure crystals)	2 ounces.
	Water	4 ,,

Mix A and B separately, and then combine in one solution.

To make two ounces of developer, pour into the graduate one drachm of No. 1 (equivalent in all to six grains of pyro) and twenty minims or a quarter of a drachm No. 2, then fill the graduate to two ounces with water. If after two or three minutes no trace of the image appears in the brilliant high lights, add to the graduate twenty minims more of the potash solution, mix with the developer, and return to the plate. Do not exceed two and a half drachms of the alkaline solution.

DEVELOPING TRANSPARENCIES ON GELATINO-CHLORIDE PLATES.

Solution A.

Neutral oxalate of potash	2 ounces.
Chloride of ammonium	40 grains.
Distilled water	20 ounces.

Solution B.

Sulphate of iron	4 drachms.
Citric acid	2 ,,
Alum	2 ,,
Distilled water	16 ounces.

For black tones mix the above in equal volumes.

DEVELOPING FORMULÆ.

COMPILED BY MESSRS. LYONEL CLARK AND E. FERRERO, OF THE CAMERA CLUB.

The Quantities are given in Grains and Minims per Ounce of Developer.

PLATES.	Pyro.	Ammonium Bromide.	Potassium Bromide.	Ammonia.	Sodium Carbonate.	Potassium Carbonate.	Ammonium Carbonate.	Sodium Sulphite.	Potassium meta-bisulphite.
	Grains.	Grains.	Grains.	Minims.	Grains.	Grains.	Grains.	Grains.	
*Abney and Derby ...	2	2 to 4	...	1·60 to 4	...	...	...	...	...
Ditto	3·60	...	...	...	...	22	...	18·80	...
*Academy	2	2	...	4	...	...	...	...	...
Albert	1·50	0·63	...	3·16	...	...	...	...	...
*Beechey (Dry Col.)	12	...	3	...	...	...	30	...	...
*Beernaert	4·78	...	...	...	16·05	...	...	32·10	...
*Britannia	2	2	...	4	...	...	...	...	...
*Cadett's	1·50	3	...	6	...	...	...	...	...
Charterhous... ...	1·36	3·40	...	1·36	...	...	...	2·72	...
Cranbourne e ...	1·10	...	0·72	2·30	...	...	...	4·40	...
*Derby...	2	2 to 4	...	1·60 to 4·00	...	...	...	...	...
Derwent	2·18	...	...	...	14·4	...	...	38·4	...
*Eastman's Pap. Neg.	4·50	...	...	...	19	...	...	27	...
*Eastman's Strip. Flm.	4·50	...	...	...	19	..	...	27	...
Do. Do.	3·53	...	...	...	12	3	...	21·18	...
* Do. Do. (NH_3)	2	0·50	...	3	...	...	...	...	2
Edwards's XL ...	2·10	0·50	...	2	...	...	...	...	...
*England's	1·50	...	1	2	...	...	...	...	...
*Ditto, Instantaneous	3·40	...	...	...	...	8·60	...	17	...
Elliott and Fry's ...	2	0·30	...	1 to 1·30	...	...	...	...	...
Elliott's	3	1	...	3	...	...	...	...	...
Ditto, Extra Special	2	1	...	3	...	...	...	...	...
Ditto, Dragon ...	2	2·80	...	3·75	...	...	...	...	...
Facilis	2	2·50	...	4·50	...	...	...	...	...
*Froedman's Tissue	3·33	...	...	...	...	8·75	...	22	...
*Fry's German (Dr. Eder's)	2	...	0·57	2	...	...	...	...	...
*Do. Kingston, Specl. *Do. Do. Instantan.	2	0·71	...	2	...	...	...	...	...
German (Sands and Hunter)	2·14	...	0·23	1·87	...	...	...	...	...

*Globe	2	1	...	4	...	...	...	...	...
*Ilford	1·85	2·50	...	4·50	...	...	...	...	...
Keystone	2·50	...	...	...	...	...	...	...	...
*Lancaster's	2·40	...	0·83	5	...	6·41	...	10	...
Ludgate	2·14	...	0·23	1·87	...	...	...	...	...
*Manchester, No. 1	2	Bromide to	Ammonia	as 1 is to 4	...	...	...	...	...
Do. No. 2	2	1·50	0·75	3	...	...	...	...	...
Do. No. 3 Sulp.-Pyro	2	0·90	0·46	1·80	...	...	...	6	...
Do. No. 4 do. (Potash)	2	...	0·12	...	...	4	...	...	...
Do. No. 5 do. (Soda)	2	...	0·12	...	4	...	...	...	...
Mawson and Swan's	1·50	0·75	...	3·75	...	...	...	...	...
Do., New Cheap	1·50	1·50	...	3·75	...	...	...	...	1·50
Do. (Soda)	1	...	0·50	...	14	...	...	21	...
Do., Photo-Mechanical and Lantern ...	1·50	0·75	...	3	...	...	...	...	...
Mawdsley	1·50	...	0·50	3	...	...	...	...	1·50
Mayfield's Spcl. Fav.	3·40 to 5·10	...	...	...	...	...	...	...	...
*Miall's	3	0·25 to 0·50	...	2·50 to 4	...	12 to 30	...	21·60 to 40·40	...
*Midland	2	0·20 to 0·40	...	0·60 to 4	...	...	...	...	...
*Monckhoven's ...	1·25	1·50	...	2 to 4	...	...	...	...	...
*Morgan and Kidd's	2	0·25	...	1	...	...	...	...	...
*Do. Richmond ...	2 or more	0·20 or more	...	0·83 or more	...	...	...	...	...
National	2·50	...	1·50	2·30	...	...	...	...	...
Nelson	2	2·90	...	11·33	...	...	...	...	...
*Obernetter	0·80	...	0·20 to 0·50	...	7 to 10	...	...	40	...
*Paget's	1·82	0·45	...	2·50	...	...	...	7·29	...
Premier	2	2·50	...	3	...	...	...	...	...
*Rouch's	1·26	1·26	...	3	...	...	...	5·04	...
*Soho	1·90	1·25	...	2·25	...	...	...	...	...
*Thomas's	1·08	1·08	...	2·40	...	...	...	4·32	...
*Do. (Potash) ...	2·25	0·11	...	...	...	9·37	...	6·75	...
*Trafalgar	1	...	1	1·30	...	...	...	...	...
*Vogel (Obernetter) Azaline Plates ...	1	...	...	...	7·50 to 11·25	...	...	50	...
*Wratten and Wainwright's Ordinary	2	...	0·33	250	...	...	...	...	...
*Wratten and Wainwright's Instant.	3	...	0·33	250	...	...	...	...	...
*Wratten and Wainwright's Special Drop-Shutter ...	3	...	0·62	250	...	...	...	...	...
*Wratten and Wainwright's (Soda)	3	...	...	...	18	...	...	18	...

* *The above analyses have been submitted to the Makers of the Plates, and asterisks are affixed to all the Formulæ of which approval has been signified.*

SOLUTIONS FOR SILVERING GLASS MIRRORS.

(In employing the following formulæ, it should be well understood that the glass plate to be silvered must be scrupulously clean.)

MARTIN'S.

A.

Nitrate of silver	175 grains.
Distilled water	10 ounces.

B.

Nitrate of ammonia	262 grains.
Distilled water	10 ounces.

C.

Pure caustic potash	1 ounce (avoirdupois).
Distilled water	10 ounces.

D.

Pure sugar candy	½ ounce (avoirdupois).
Distilled water	5 ounces.

Dissolve and add—

Tartaric acid .... 50 grains.

Boil in a flask for ten minutes, and when cool add—

Alcohol .... 1 ounce.

Distilled water *quant. suff.* to make up to 10 ounces.

For use take equal parts of A and B. Mix together also equal parts of C and D, and mix in another measure. Then mix both these mixtures together in the silvering vessel, and suspend the mirror face downward in the solution.

BURTON'S.

Solution 1.

Nitrate of silver	25 grains.
Distilled water	1 ounce.

Solution 2.

Potash (pure)	25 grains.
Distilled water	1 ounce.

Solution A.

Solution 1 } Solution 2 }	equal parts.
Ammonia	to just dissolve the precipitate.
Solution 1	to just cause a discolouration.

Solution B.

Loaf sugar	2700 grains.
Distilled water	20 ounces.
Nitric acid	2 drachms.
Alcohol (strong)	10 ounces.
Distilled water to make	80 ,,

For use—

Solution A	1 ounce.
Solution B	1 drachm.

Solution A is subject to slow decomposition; Solution B, on the contrary, improves by keeping.

CHROMOGRAPH MIXTURES.

Make a zinc tray about a quarter of an inch in depth, and pour into it a warm solution made as follows:—

Water	4 ounces.
Sulphate of baryta	2½ ,,
Sugar	1 ounce.
Gelatine	1 ,,
Glycerine	6 ounces.

Write whatever is required to be printed upon a sheet of white paper, using instead of ordinary ink the aniline colour known as 'violet of methylaniline;' as soon as the writing is pretty dry, lay it upon the gelatine surface and rub the back of the paper with the palm of the hand. The ink will be absorbed by the gelatinous product. All that is to be done in order to obtain a *facsimile* of the writing is to lay a sheet of paper upon the writing on the gelatine and rub the back with the hand. From forty to fifty can thus be drawn off in a few minutes.

INK FOR RUBBER STAMPS.

Aniline red (violet)	90 grains.
Boiling distilled water	1 ounce.
Glycerine	half a teaspoonful.
Treacle	half as much as glycerine.

INTENSIFYING NEGATIVES.

A.

Bichloride of mercury	1 ounce.
Chloride of ammonia	1 ,,
Potassic iodide	1 ,,

Dissolve the mercury and ammonia salts in ten ounces of water, putting them both in together, and add sufficient of the strong iodide of potash solution; shake well, and make up to twenty ounces with water.

B.

Silver nitrate	½ ounce.
Potassium cyanide, sufficient to dissolve out the first precipitate.	

Now make up this bulk to twenty ounces with water.

This solution should not be used at full strength when little density is required, but diluted to half. The fixed and well-washed negatives should be placed in a dish containing the A solution, and gently kept in motion for a few seconds. Examine from time to time until it appears quite dense, take out and well wash again until the film is an even yellow all over, then place in a dish containing the B solution, and let remain until the film becomes a beautiful olive-brown, then lift out and set aside to dry.

TO CLEAR NEGATIVES.

Negatives which, after development by ferrous oxalate, are opalescent from oxalate of lime, are immersed in the following solution :—

Water	100 parts.
Oxalate of iron	2 ,,
Alum	8 ,,

By which the opalescence will be completely cleared, and the whites of the negative will remain transparent.

A BRILLIANT BLACK VARNISH

For iron, stone, or wood, can be made by thoroughly incorporating ivory black with common shellac varnish. The mixture should be laid on very thin. But ordinary coal-tar varnish will serve the same purpose in most cases quite as well, and it is not nearly so expensive.

TO REMOVE SILVER STAINS FROM GELATINE NEGATIVES.

Remove the varnish and apply the following :—

A.	Sulphocyanide of ammonia	½ drachm.
	Water	1 ounce.
B.	Nitric acid	½ drachm.
	Water	1 ounce.

A freshly-mixed solution being used for each negative. This is followed, after washing, by the application of a saturated solution of chrome alum.

TO PHOTOGRAPH ON SILK.

Immerse the silk in

Water	1 ounce.
Gelatine	5 grains.
Chloride of sodium	5 ,,

Hang it up to dry; then float for half a minute on a fifty-grain solution of nitrate of silver; dry, print, tone, and fix, as usual.

FREEZING MIXTURES.

THE following mixtures will be found useful where ice is not readily obtainable—

	Ingredients.	Parts by Weight.	Temperature Produced Starting at 10°C.	Diminution of Temperature.
1	Water	1	16°C.	26°C.
	Nitrate of ammonia	1		
2	Water	16	12°	22°
	Saltpetre	5		
	Chloride of ammonium (sal ammoniac)	5		
3	Water	1	19°	29°
	Nitrate of ammonia	1		
	Carbonate of soda	1		
4	Snow	5	..	20°
	Chloride of sodium	2	..	
5	Snow	1	..	45°
	Crystallised chloride of calcium	2	..	
6	Crystallised sulphate of soda	8	20°	30°
	Hydrochloric acid	5		

INLAND PARCELS POST.

EVERY Post Office is open to the public for Parcels Post business on Week Days during the same hours as for general postal business. On Sundays Parcels Post business is not transacted.

RATES OF POSTAGE AND WEIGHT.—Three halfpence for each pound after the first, which is threepence.

PREPAYMENT OF POSTAGE.—All parcels must be prepaid. LIMITATION OF WEIGHT.—No Parcel exceeding 11 lbs. in weight can be received for transmission by Parcels Post. LIMITATION OF SIZE.—No Parcel may exceed 3 ft. 6 in. in length, or 6 ft. in length and girth combined. POSTING OF PARCELS.—Parcels must be handed in at a Post Office Counter, and must not be dropped into a Letter Box.

TABLE OF THE SYMBOLS, ATOMICITY, ATOMIC, AND EQUIVALENT WEIGHTS OF THE ELEMENTS.

Name.		Symbol and Atomicity.	Atomic Weight.	Equivalent Weight.
Aluminium		Al^{iii}	27·4	9·13
Antimony (Stibium)		Sb^{iii}	122·0	40·66
Arsenic		As^{iii}	75·0	25·0
Barium		Ba^{ii}	137·0	68·5
Bismuth		Bi^{iii}	208·0	69·33
Boron		B^{iii}	11·0	3·66
Bromine		Br^{i}	80·0	80·0
Cadmium		Cd^{ii}	112·0	56·0
Cæsium		Cs^{i}	133·0	133·0
Calcium		Ca^{ii}	40·0	20·0
Carbon		C^{iv}	12·0	3·0
Cerium		Ce^{ii}	92·0	46·0
Chlorine		Cl^{i}	35·5	35·5
Chromium		Cr^{ii}	52·2	26·1
Cobalt		Co^{ii}	58·8	29·4
Columbium (or Niobium)		Cb^{v}	94·0	18·8
Copper (Cuprum)	Cuprosum	Cu^{i}	63·4	63·4
	Cupricum	Cu^{ii}	63·4	31·7
Davyum		Da	...	...
Didymium		Di^{ii}	95·0	47·5
Erbium		E^{ii}	112·6	56·3
Fluorine		Fl^{i}	19·0	19·0
Gallium		Ga	68·0	...
Glucinum		G^{ii}	9·4	4·7
Gold (Aurum)		Au^{iii}	196·0	65·33
Hydrogen		H^{i}	1·0	1·0
Indium		In^{iii}	113·4	37·8
Iodine		I^{i}	127·0	127·0
Iridium		Ir^{iv}	198·0	49·5
Iron (Ferrum)	Ferrosum	Fe^{ii}	56·0	28·0
	Ferricum	Fe^{iii}	56·0	18·66
Lanthanum		La^{ii}	92·8	46·4
Lead (Plumbum)		Pb^{ii}	207·0	103·5
Lithium		Li^{i}	7·0	7·0
Magnesium		Mg^{ii}	24·0	12·0
Manganese		Mn^{ii}	55·0	27·5
Mercury (Hydrargyrum)	Mercurosum	Hg	200·0	200·0
	Mercuricum	Hg^{ii}	200·0	100·0
Molybdenum		Mo^{ii}	92·0	46·0
Nickel		Ni^{ii}	58·8	29·4
Nitrogen		N^{iii}	14·0	4·66
Osmium		Os^{iv}	199·0	49·75
Oxygen		O^{ii}	16·0	8·0
Palladium		Pd^{ii}	106·5	53·25

TABLE OF SYMBOLS, &c.—Continued.

Name.	Symbol and Atomicity.	Atomic Weight.	Equivalent Weight.
Phosphorous	P^{iii}	31·0	10·33
Platinum — Platinosum	Pt^{ii}	197·4	98·7
Platinum — Platinicum	Pt^{iv}	197·4	49·35
Potassium (Kalium)	K	39·1	39·1
Rhodium	Rh^{ii}	104·4	52·2
Rubidium	Rb^{i}	85·4	85·4
Ruthenium	Ru^{iv}	104·0	26·0
Selenium	Se^{ii}	79·4	39·7
Silicium (or Silicon)	Si^{iv}	28·0	7·0
Silver (Argentum)	Ag^{i}	108·0	108·0
Sodium (Natrium)	Na^{i}	23·0	23·0
Strontium	Sr^{ii}	87·5	43·75
Sulphur	S^{ii}	32·0	16·0
Tantalum	Ta^{v}	182·0	36·4
Tellurium	Te^{ii}	128·0	64·0
Thallium	Te^{i}	204·0	204·0
Thorium (or Thorinum)	Th^{iv}	231·5	57·87
Tin (Stannum) — Stannosum	Sn^{ii}	118·0	59·0
Tin (Stannum) — Stannicum	Sn^{iv}	118·0	29·5
Titanium	Ti^{iv}	50·0	12·5
Tungsten (Wolfram)	W^{iv}	184·0	46·0
Uranium	Ur^{ii}	120·0	60·0
Vanadium	V^{iii}	51·3	17·1
Yttrium	Y^{ii}	61·7	30·85
Zinc	Zn^{ii}	65·2	32·6
Zirconium	Zr^{iv}	89·6	22·4

RATES OF POSTAGE FOR INLAND LETTERS.

The rates of postage to be prepaid are as follow, viz. :—

For a letter not exceeding 1 oz.		1*d.*
,, exceeding 1 oz., but not exceeding	2 ozs.	1½*d.*
,, ,, 2 ,, ,,	4 ,,	2*d.*
,, ,, 4 ,, ,,	6 ,,	2½*d.*
,, ,, 6 ,, ,,	8 ,,	3*d.*
,, ,, 8 ,, ,,	10 ,,	3½*d.*
,, ,, 10 ,, ,,	12 ,,	4*d.*
,, ,, 12 ,, ,,	14 ,,	4½*d.*

And so on at the rate of ½*d.* for every additional two ounces.

For Contents, *see p.* 565.
For Formulæ, *see p.* 517.
For Index to Advertisers, *see p.* 583.
For Postal and Telegraphic Addresses, *see p.* 688.

TABLE OF SYMBOLS OF THE MORE IMPORTANT COMPOUNDS USED IN PHOTOGRAPHY.

Name.	Symbol.	
Acid, Acetic (Cryst.)	$H, C_2 H_3 O_2$	60
,, Citric	$H_3, C_6 H_5 O_7 + H_2 O$	210
,, Formic	H, CHO_2	46
,, Gallic	$H, C_7 H_5 O_5$	170
,, Hydriodic	HI	128
,, Hydrobromic	$H Br$	81
,, Hydrochloric	$H Cl$	36·5
,, Hydrocyanic	$H CN$	27
,, Hydrosulphuric	$H_2 S$	34
,, Nitric	H, NO_3	63
,, Oxalic	$H_2 C_2 O_4 + 2 H_2 O$	126
,, Pyrogallic	$H_3 C_6 H_3 O_3$	126
,, Sulphuric	$H_2 SO_4$	98
,, Sulphurous	$H_2 SO_3$	82
,, Tannic	$H_4 C_{27} H_{18} O_{17}$	618
,, Tartaric	$H_4 C_4 H_2 O_6$	150
Alum, Chrome	$Cr K (SO_4)_2 12 H_2 O$	499·3
,, (Potash)	$Al K (SO_4)_2 12 H_2 O$	474·5
Ammonium, Bromide	$NH_4 Br$	98
,, Carbonate	$(NH_4)_2 CO_3$	96
,, Chloride	$NH_4 Cl$	53·5
,, Iodide	$NH_4 I$	145
,, Nitrate	NH_4, NO_3	80
,, Sulphydrate of	NH_4, HS	51
,, Sulphocyanide of	NH_4, CNS	76
Barium, Bromide	$Ba Br_2$	297
,, Chloride (Cryst.)	$Ba, Cl_2 + 2 H_2 O$	244
,, Iodide	$Ba I_2$	391
,, Nitrate	$Ba, (NO_3)_2$	261
Cadmium, Bromide (Cryst.)	$Cd, Br_2 + 4 H_2 O$	344
,, Chloride	$Cd Cl_2$	183
,, Iodide	$Cd I_2$	366
Calcium, Bromide (Cryst.)	$Ca Br_2 + 4 H_2 O$	272
,, Chloride	$Ca Cl_2$	111
,, Iodide	$Ca I_2$	294
Copper, Bromide (cupric)	$Cu Br_2$	223·4
,, Chloride ,,	$Cu Cl_2 2 H_2 O$	170·4
,, Sulphate ,,	$Cu SO_4 5 H_2 O$	249·4
Gold, Terchloride	$Au Cl_3$	302·5
Iron, Chloride (ferrous)	$Fe Cl_2$	127
,, ,, (ferric)	$Fe_2 Cl_6$	325
,, Iodide	$Fe I_2$	310
,, Oxalate (ferrous)	$Fe C_2 O_4$	144
,, ,, (ferric)	$Fe_2 (C_2 O_4)_3$	376
,, Sulphate (ferrous)	$Fe SO_4 + 7 H_2 O$	278
,, ,, (ferric)	$Fe_2 (SO_4)_3$	400
,, Ammonia-sulphate	$Fe SO_4, (NH_4)_2 SO_4 + 6 H_2 O$	392
Lead, Acetate (Cryst.)	$Pb, (C_2 H_3 O_2)_2 + H_2 O$	343

TABLES OF SYMBOLS, &c.—CONTINUED.

NAME.	SYMBOL.	
Lead, Nitrate	$Pb, (NO_3)_2$	331
Lithium, Bromide	$Li\ Br$	87
,, Chloride	$Li\ Cl$	42·5
,, Iodide	$Li\ I$	134
Magnesium, Bromide	$Mg\ Br_2$	184
,, Chloride	$Mg\ Cl_2$	95
,, Iodide	$Mg\ I_2$	278
Mercury, Chloride (Mercuric)	$Hg\ Cl_2$	271
Platinum, Chloride	$Pt\ Cl_4$	339·4
Potassium, Bichromate	$K_2\ Cr_2\ O_7$	294·6
,, Bromide	$K\ Br$	119·1
,, Carbonate	$K_2\ CO_3$	138·2
,, Chloride	$K\ Cl$	74·6
,, Citrate	$K_3\ C_6\ H_5\ O_7 + H_2\ O$	324·3
,, Cyanide	$K\ C\ N$	65·1
,, Ferridcyanide	$K_6\ Fe_2\ Cy_{12}$	658·6
,, Ferrocyanide	$K_4\ Fe\ Cy_6$	368·4
,, Hydrate	$K\ OH$	56·1
,, Iodide	$K\ I$	166·1
,, Nitrate	$K\ NO_3$	101·1
,, Permanganate	$K_2\ Mn_2\ O_8$	316·2
Silver, Acetate	$Ag\ C_2\ H_3\ O_2$	167
,, Bromide	$Ag\ Br$	188
,, Carbonate	$Ag_2\ CO_3$	276
,, Chloride	$Ag\ Cl$	143·5
,, Citrate	$Ag_3\ C_6H_5O_7$	513
,, Fluoride	$Ag\ Fl$	127
,, Iodide	$Ag\ I$	235
,, Nitrate	$Ag\ NO_3$	170
,, Oxalate	$Ag_2\ C_2\ O_4$	304
,, Oxide	$Ag_2\ O$	232
,, Sulphide	$Ag_2\ S$	248
Sodium, Acetate (Cryst.)	$Na\ C_2\ H_3\ O_2\ 3\ H_2\ O$	136
,, Biborate (Borax)	$Na_2\ B_4\ O_7 + 10\ H_2\ O$	382
,, Bromide	$Na\ Br$	103
,, Carbonate (Cryst.)	$Na_2\ CO_3 + 10\ H_2\ O$	286
,, Chloride	$Na\ Cl$	58·5
,, Citrate	$2\ (Na_3\ C_6\ H_5\ O_7)\ 11\ H_2\ O$	714
,, Hyposulphite (Cryst.)	$Na_2\ S_2\ O_3 + 5\ H_2\ O$	248
,, Iodide	$Na\ I$	150
,, Sulphite	$Na_2\ SO_3\ 7\ H_2\ O$	252
Strontium, Bromide	$Sr\ Br_2$	247·5
,, Chloride	$Sr\ Cl_2$	158·5
,, Iodide	$Sr\ I_2$	341·5
Uranium, Bromide	$U\ Br_2\ 4\ H_2\ O$	352
,, Nitrate	$U_2\ O_2\ (NO_3)_2\ 6\ H_2\ O$	504
Zinc, Bromide	$Zn\ Br_2$	225·2
,, Chloride	$Zn\ Cl_2$	136·2
,, Iodide	$Zn\ I_2$	319·2

TABLE OF THE SOLUBILITIES OF THE PRINCIPAL SUBSTANCES USED IN PHOTOGRAPHY.

	One part is soluble in — parts of water. Cold.	Boiling.	100 parts of water dissolve at ordinary temperature.	Solubility in Alcohol.
Acid, Boracic (Anhydrous)	47·01	...	2·13	soluble
,, ,, (Cryst.)	25·66	3·0	3·9	sol. in 6 parts @ 60°
,, Citric	0·75	0·5	133·0	sol. in 1·15 pt. s. g. 820
,, Gallic	100·0	3·0	1·0	soluble in 4 parts
,, Oxalic	15·5	1·0	6·47	insoluble
,, Pyrogallic	2·25	...	...	sol. in alc. and ether
,, Salicylic	87·2	vry sol	0·35	easily soluble
,, Succinic	5·0	2·2	20·0	soluble in 3 parts
,, Tannic	very	solubl	e	sol. in alc. and ether
,, Tartaric	·66	·5	150·0	soluble
Alum (Potash)	10·5	vry sol	9·52	insoluble
,, (Ammonia)	7·32	,,	13·66	,,
Ammonium, Bromide	1·4	0·78	41·1	sol. in 32·3 parts
,, Carbonate	3·3	·833	33·0	insoluble
,, Chloride	2·7	1·00	37·02	sparingly soluble
,, Citrate	deliqu	escent	vy. sol.	less sol. in alcohol
,, Iodide	very	solubl	e	soluble
,, Nitrate	2·0	1·0	50·0	freely soluble
,, Salicylate	very	solubl	e	
,, Succinate	,,	,,		
,, Sulphocyanide	deliqu	escent	easily	sol. in water and alc.
Barium, Bromide	·96	...	104·2	easily soluble
,, Chloride { Crystallised	2·18	...	46·0	very slightly soluble
,, Chloride { Anhydrous.	2·862	...	34·1	
,, Iodide	0·48	0·35	208·3	easily soluble
,, Nitrate	12·2	2·84	8·18	
Cadmium, Bromide	easily	solubl	e	easily soluble
,, Chloride	0·71	0·67	...	,,
,, Iodide	1·08	0·75	92·6	very soluble
Calcium, Bromide (Cryst.)	0·97	...	102·56	easily soluble
,, Chloride	0·25	any qy	400·0	
,, Iodide	deliqu	escent		
Cobalt, Chloride	very	solubl	e	sol. in alc. and ether
Copper, Bromide (Cupric)	deliqu	escent	vy. sol.	,, ,,
,, Chloride ,,	,,	,,	,,	,, ,,
,, Nitrate	solubl	e	...	very soluble
,, Sulphate	2·5	...	40·0	insoluble
Gold, P rchloride	deliqu	escent	vy. sol.	soluble in ether
Iron, Chloride (Ferrous) { Anhyd.	2·0	...	50·0	sol. in 1 part alcohol
Iron, Chloride (Ferrous) { Hydrated	0·68	...	147·0	easily soluble

TABLE OF THE SOLUBILITIES, &c.—CONTINUED.

	One part is soluble in — parts of water. Cold.	Boiling.	100 parts of water dissolve at ordinary temperature.	Solubility in Alcohol.
Iron, Chloride (Ferric)	very	del. &	sol.	very soluble
,, Oxalate ,, ...	insolu	ble, ex	cept in	excess of oxalic acid
,, Sulphate ,, ...	solubl	e	...	soluble
,, ,, (Ferrous) ...	1·3	·30	77·0	insoluble
Lead, Acetate	3·7	3·45	27·0	soluble in 12·5 parts
,, Nitrate	7·7	...	13·0	
Lithium, Bromide	0·66	...	149·8	soluble
,, Chloride	1·315	...	76·0	
,, Iodide	0·61	...	164·0	
Magnesium, Bromide	deliqu	escent	vy. sol.	very soluble
,, Chloride	1·857	...	53·8	
,, Iodide	deliqu	escent	vy. sol.	soluble
,, Sulphate	1·47	0·66	68·04	slightly soluble
Mercury, Chloride .... (Mercuric)	16·0	3·0	6·25	soluble in 2·35 parts
Platinum, Bichloride.........	solubl	e	...	easily sol. in alc. & ether
Potassium, Bichromate ...	10·0	...	10·0	
,, Bromide	1·55	...	64·5	
,, Carbonate	0·9	...	111·0	
,, Chloride	3·03	2·0	33·0	slightly soluble
,, Citrate	very	solubl	e	
,, Cyanide	deliqu	escent	vy. sol.	insol. in pure alcohol
,, Ferrocyanide ...	3·0	1·0	33·3	insoluble
,, Ferricyanide ...	2·54	1·22	39·37	very sparingly soluble
,, Hydrate	0·5	...	200·0	very soluble
,, Iodide	0·7	0·27	143·0	sol. in 40 pts. abs. alc.
,, Nitrate............	3·5	0·4	28·57	insoluble
,, Nitrite	deliqu	& solu	ble	
,, Oxalate(neutral)	3·0	...	33·3	slightly soluble
,, ,, (bin.) ...	40·0	...	2·5	insoluble
,, ,, (quad.)..	20·17	...	4·95	insoluble
,, Permanganate..	16·0	...	6·25	insoluble
,, Sulphocyanide..				
Silver, Acetate	very	slightl	y sol.	
,, Citrate..................	solubl	e in wa	rm wate	r
,, Fluoride	deliqu	escent		
,, Nitrate	1·0	0·5	100·0	sol. in 4 pts. boiling alc.
,, Nitrite	300·0	dissol. easily	0·33	insoluble
,, Oxalate	spar'ly sol.	solubl	e	insoluble

TABLE OF THE SOLUBILITIES, &c.—Continued.

	One part is soluble in — parts of water. Cold.	Boiling.	100 parts of water dissolve at ordinary temperature.	Solubility in Alcohol.
Silver, Sulphate	200·0	88 0	0·5	insoluble
Sodium, Acetate (Cryst.) ...	2·86	·66	35·0	
,, Biborate (Borax)...	12·44	2·0	8·033	insoluble
,, Bromide	1·13	...	88·5	
,, Carbonate (Cryst.)	2·0	1·0	50·0	insoluble
,, ,, (Anhyd.)	3·85	2·07	25·93	insoluble
,, Chloride	2·77	2·77	36·0	sparingly soluble
,, Citrate	1·0	...	100·0	sparingly soluble
,, Hydrate	1·65	...	60·63	easily soluble
,, Hyposulphite ... (Thiosulphate)	deliqu	escent	vy. sol.	insoluble
,, Iodide	0·55	0·3	180·0	sparingly soluble
,, Nitrate	1·136	...	88·03	sol. in 37 parts alc.
,, Nitrite	deliqu	escent	vy. sol.	very soluble
,, Phosphate	4·0	2·0	25·0	
,, Succinate	very s	oluble		
,, Sulphate	2·08	0·41	48·0	soluble
,, Sulphite	4·0	...	25·0	slightly soluble
,, Bisulphite	very s	oluble	...	insoluble
,, Sulphocyanide ...				
,, Tartrate	1·75	...	56·37	insoluble
,, Tungstate	4·0	2·0	25·0	
Strontium, Bromide	1·01	...	99·0	sparingly soluble
,, Chloride	1·88	...	53·0	feebly soluble
,, Iodide	0·56	0·27	178·5	
Uranium, Bromide ...... (Hydrated)...	deliqu	& solu	ble	soluble
,, Nitrate	0·5	...	200·0	sol. in alc. and ether
,, Oxalate	nearly insol.	30·0	...	insoluble
Zinc, Bromide	deliqu	escent	vy. sol.	very soluble
,, Chloride	0·333	...	300·0	very soluble
,, Iodide	vy. de	liques.	& sol.	very soluble

Percentage of Real Ammonia in Solutions of different Densities at 14° Centigrade.—Carius.

Specific Gravity.	Percentage Ammonia.	Specific Gravity.	Percentage Ammonia.	Specific Gravity.	Percentage Ammonia.	Specific Gravity.	Percentage Ammonia.
0·8844	36·0	0·9052	27·0	0·9314	18·0	0·9631	9·0
0·8864	35·0	0·9078	26·0	0·9347	17·0	0·9670	8·0
0·8885	34·0	0·9106	25·0	0·9380	16·0	0·9709	7·0
0·8907	33·0	0·9133	24·0	0·9414	15·0	0·9749	6·0
0·8929	32·0	0·9162	23·0	0·9449	14·0	0·9790	5·0
0·8953	31·0	0·9191	22·0	0·9484	13·0	0·9831	4·0
0·8976	30·0	0·9221	21·0	0·9520	12·0	0·9873	3·0
0·9001	29·0	0·9251	20·0	0·9556	11·0	0·9915	2·0
0 9026	28·0	0·9283	19·0	0·9593	10·0	0·9959	

FRENCH FLUID MEASURES.

The cubic centimètre, usually represented by 'c. c.,' is the unit of the French measurement for liquids. It contains nearly seventeen minims of water; in reality, it contains 16·896 minims. The weight of this quantity of water is one gramme. Hence it will be seen that the cubic centimètre and the gramme bear to each other the same relation as our drachm for solids and the drachm for fluids, or as the minim and the grain. The following table will prove to be sufficiently accurate for photographic purposes:—

1	cubic centimètre	=	17 minims (as near as possible).					
2	cubic centimètres	=	34	,,				
3	,,	=	51	,,				
4	,,	=	68	,,	or		1 drachm	8 minims.
5	,,	=	85	,,	,,		1 ,,	25 ,,
6	,,	=	102	,,	,,		1 ,,	42 ,,
7	,,	=	119	,,	,,		1 ,,	59 ,,
8	,,	=	136	,,	,,		2 drachms	16 ,,
9	,,	=	153	,,	,,		2 ,,	33 ,,
10	,,	=	170	,,	,,		2 ,,	50 ,,
20	,,	=	340	,,	,,		5 ,,	40 ,,
30	,,	=	510	,,	,,	1 ounce	0 drachm	30 minims.
40	,,	=	680	,,	,,	1 ,,	3 drachms	20 ,,
50	,,	=	850	,,	,,	1 ,,	6 ,,	10 ,,
60	,,	=	1020	,,	,,	2 ounces	1 ,,	0 ,,
70	,,	=	1190	,,	,,	2 ,,	3 ,,	50 ,,
80	,,	=	1360	,,	,,	2 ,,	6 ,,	40 ,,
90	,,	=	1530	,,	,,	3 ,,	1 ,,	30 ,,
100	,,	=	1700	,,	,,	3 ,,	4 ,,	20 ,,

THE CONVERSION OF FRENCH INTO ENGLISH WEIGHT.

Although a gramme is equal to 15·4346 grains, the decimal is one which can never be used by photographers; hence in the following table it is assumed to be 15$\frac{2}{5}$ grains, which is the nearest approach that can be made to *practical* accuracy:

1	gramme	=	15$\frac{2}{5}$	grains.			
2	grammes	=	30$\frac{4}{5}$	,,			
3	,,	=	46$\frac{1}{5}$	,,			
4	,,	=	61$\frac{3}{5}$	,,	.... or	1 drachm	1$\frac{3}{5}$ grain.
5	,,	=	77	,,	.... ,,	1 ,,	17 grains.
6	,,	=	92$\frac{2}{5}$	,,	.... ,,	1 ,,	32$\frac{2}{5}$,,
7	,,	=	107$\frac{4}{5}$	,,	.... ,,	1 ,,	47$\frac{4}{5}$,,
8	,,	=	123$\frac{1}{5}$	,,	.... ,,	2 drachms	3$\frac{1}{5}$,,
9	,,	=	138$\frac{3}{5}$	,,	.... ,,	2 ,,	18$\frac{3}{5}$,,
10	,,	=	154	,,	.... ,,	2 ,,	34 ,,
11	,,	=	169$\frac{2}{5}$	,,	.... ,,	2 ,,	49$\frac{2}{5}$,,
12	,,	=	184$\frac{4}{5}$	,,	.... ,,	3 ,,	4$\frac{4}{5}$,,
13	,,	=	200$\frac{1}{5}$	,,	.... ,,	3 ,,	20$\frac{1}{5}$,,
14	,,	=	215$\frac{3}{5}$	,,	.... ,,	3 ,,	35$\frac{3}{5}$,,
15	,,	=	231	,,	.... ,,	3 ,,	51 ,,
16	,,	=	246$\frac{2}{5}$	,,	.... ,,	4 ,,	6$\frac{2}{5}$,,
17	,,	=	261$\frac{4}{5}$	,,	.... ,,	4 ,,	21$\frac{4}{5}$,,
18	,,	=	277$\frac{1}{5}$	,,	.... ,,	4 ,,	37$\frac{1}{5}$,,
19	,,	=	292$\frac{3}{5}$	,,	.... ,,	4 ,,	52$\frac{3}{5}$,,
20	,,	=	308	,,	.... ,,	5 ,,	8 ,,
30	,,	=	462	,,	.... ,,	7 ,,	42 ,,
40	,,	=	616	,,	.... ,,	10 ,,	16 ,,
50	,,	=	770	,,	.... ,,	12 ,,	50 ,,
60	,,	=	924	,,	.... ,,	15 ,,	24 ,,
70	,,	=	1078	,,	.... ,,	17 ,,	58 ,,
80	,,	=	1232	,,	.... ,,	20 ,,	32 ,,
90	,,	=	1386	,,	.... ,,	23 ,,	6 ,,
100	,,	=	1540	,,	.... ,,	25 ,,	40 ,,

THERMOMETRIC TABLES,

Showing the Assimilation of the Thermometers in Use Throughout the World.

Celsius.	Réaumur.	Fahrenheit.	Celsius.	Réaumur.	Fahrenheit.
100	80·0	212·0	49	39·2	120·2
99	79·2	210·0	48	38·4	118·4
98	78·4	208·4	47	37·6	116·6
97	77·6	206·6	46	36·8	114·8
96	76·8	204·8	45	36·0	113·0
95	76·0	203·0	44	35·2	111·2
94	75·2	201·2	43	34·8	109·4
93	74·4	199·4	42	33·6	107·6
92	73·6	197·6	41	32·8	105·8
91	72·8	195·8	40	32·0	104·0
90	72·0	194·0	39	31·2	102·2
89	71·2	192·2	38	30·4	100·4
88	70·4	190·4	37	29·6	98·6
87	69·6	188·6	36	28·8	96·8
86	68·8	186·8	35	28·0	95·0
85	68·0	185·0	34	27·2	93·2
84	67·2	183·2	33	26·4	91·4
83	66·4	181·4	32	25·6	89·6
82	65·6	179·6	31	24·8	87·8
81	64·8	177·8	30	24·0	86·0
80	64·0	176·0	29	23·2	84·2
79	63·2	174·2	28	22·4	82·4
78	62·4	172·4	27	21·6	80·6
77	61·6	170·6	26	20·8	78·8
76	60·8	168·8	25	20·0	77·0
75	60·0	167·0	24	19·2	75·2
74	59·2	165·2	23	18·4	73·4
73	58·4	163·4	22	17·6	71·6
72	57·6	161·6	21	16·8	69·8
71	56·8	159·8	20	16·0	68·0
70	56·0	158·0	19	15·2	66·2
69	55·2	156·2	18	14·4	64·4
68	54·4	154·4	17	13·6	62·6
67	53·6	152·6	16	12·8	60·8
66	52·8	150·8	15	12·0	59·0
65	52·0	149·0	14	11·2	57·2
64	51·2	147·2	13	10·4	55·4
63	50·4	145·4	12	9·6	53·6
62	49·6	143·6	11	8·8	51·8
61	48·8	141·8	10	8·0	50·0
60	48·0	140·0	9	7·2	48·2
59	47·2	138·2	8	6·4	46·4
58	46·4	136·4	7	5·6	44·6
57	45·6	134·6	6	4·8	42·8
56	44·8	132·8	5	4·0	41·0
55	44·0	131·0	4	3·2	39·2
54	43·2	129·2	3	2·4	37·4
53	42·4	127·4	2	1·6	36·5
52	41·6	125·6	1	0·8	33·8
51	40·8	123·8	0	0·0	32·0
50	40·0	122·0			

TABLE FOR ENLARGEMENTS.

Focus of Lens, inches.	TIMES OF ENLARGEMENT AND REDUCTION.							
	1 inches.	**2** inches.	**3** inches.	**4** inches.	**5** inches.	**6** inches.	**7** inches.	**8** inches.
2	4 4	6 3	8 $2\frac{3}{4}$	10 $2\frac{1}{2}$	12 $2\frac{2}{5}$	14 $2\frac{1}{3}$	16 $2\frac{2}{7}$	18 $2\frac{1}{4}$
$2\frac{1}{2}$	5 5	$7\frac{1}{2}$ $3\frac{3}{4}$	10 $3\frac{1}{3}$	$12\frac{1}{2}$ $3\frac{1}{8}$	15 3	$17\frac{1}{2}$ $2\frac{11}{12}$	20 $2\frac{6}{7}$	$22\frac{1}{2}$ $2\frac{13}{16}$
3	6 6	9 $4\frac{1}{2}$	12 4	15 $3\frac{3}{4}$	18 $3\frac{3}{5}$	21 $3\frac{1}{2}$	24 $3\frac{3}{7}$	27 $3\frac{3}{8}$
$3\frac{1}{2}$	7 7	$10\frac{1}{2}$ $5\frac{1}{4}$	14 $4\frac{2}{3}$	$17\frac{1}{2}$ $4\frac{3}{4}$	21 $4\frac{1}{5}$	$24\frac{1}{2}$ $4\frac{1}{12}$	28 4	$31\frac{1}{2}$ $3\frac{15}{16}$
4	8 8	12 6	16 $5\frac{1}{4}$	20 5	24 $4\frac{4}{5}$	28 $4\frac{2}{3}$	32 $4\frac{4}{7}$	36 $4\frac{1}{2}$
$4\frac{1}{2}$	9 9	$13\frac{1}{2}$ $6\frac{3}{4}$	18 6	$22\frac{1}{2}$ $5\frac{5}{8}$	27 $5\frac{2}{5}$	$31\frac{1}{2}$ $5\frac{1}{4}$	36 $5\frac{1}{7}$	$40\frac{1}{2}$ $5\frac{1}{16}$
5	10 10	15 $7\frac{1}{2}$	20 $6\frac{2}{3}$	25 $6\frac{1}{4}$	30 6	35 $5\frac{5}{6}$	40 $5\frac{5}{7}$	45 $5\frac{5}{8}$
$5\frac{1}{2}$	11 11	$16\frac{1}{2}$ $8\frac{1}{4}$	22 $7\frac{1}{8}$	$27\frac{1}{2}$ $6\frac{7}{8}$	33 $6\frac{1}{2}$	$38\frac{1}{2}$ $6\frac{5}{12}$	44 $6\frac{2}{7}$	$49\frac{1}{2}$ $6\frac{3}{16}$
6	12 12	18 9	24 8	30 $7\frac{1}{2}$	36 $7\frac{1}{6}$	42 7	48 $6\frac{6}{7}$	54 $6\frac{3}{4}$
7	14 14	21 $10\frac{1}{2}$	28 $9\frac{1}{3}$	35 $8\frac{3}{4}$	42 $8\frac{2}{5}$	49 $8\frac{1}{6}$	56 8	63 $7\frac{7}{8}$
8	16 16	24 12	32 $10\frac{2}{3}$	40 10	48 $9\frac{3}{5}$	56 $9\frac{1}{3}$	64 $9\frac{1}{7}$	72 9
9	18 18	27 $13\frac{1}{2}$	36 12	45 $11\frac{1}{4}$	54 $10\frac{4}{5}$	63 $10\frac{1}{2}$	72 $10\frac{2}{7}$	81 $10\frac{1}{8}$

THE object of this table is to enable any manipulator who is about to enlarge (or reduce) a copy any given number of times, to do so without troublesome calculation. It is assumed that the photographer knows exactly what the focus of his lens is, and that he is able to measure accurately from its optical centre. The use of the table will be seen from the following illustration:—A photographer has a *carte* to enlarge to four times its size, and the lens he intends employing is one of six inches equivalent focus. He must, therefore, look for 4 on the upper horizontal line, and for 6 in the first vertical column, and carry his eye to where these two join, which will be at 30—$7\frac{1}{2}$. The greater of these is the distance the sensitive plate must be from the centre of the lens; and the lesser, the distance of the picture to be copied. To *reduce* a picture any given number of times the same method must be followed, but in this case the greater number will represent the distance between the lens and the picture to be copied; the latter, that between the lens and the sensitive plate. This explanation will be sufficient for every case of enlargement or reduction.

If the focus of the lens be twelve inches, as this number is not in the column of focal lengths, look out for six in this column and multiply by 2 and so on with any other numbers.

WEIGHTS AND MEASURES.

APOTHECARIES' WEIGHT.

SOLID MEASURE.

20 Grains	=	1 Scruple	=	20	Grains.
3 Scruples	=	1 Drachm	=	60	,,
8 Drachms	=	1 Ounce	=	480	,,
12 Ounces	=	1 Pound	=	5760	,,

FLUID.

			Symbol.
60 Minims	=	1 Fluid Drachm	f. ʒ
8 Drachms	=	1 Ounce	f.
20 Ounces	=	1 Pint	O ʒ
8 Pints	=	1 Gallon	gall.

The above weights are those usually adopted in formulæ.

All Chemicals are usually sold by

AVOIRDUPOIS WEIGHT.

27⅓ ½ Grains	=	1 Drachm	=	27⅓ ½	Grains.
16 Drams	=	1 Ounce	=	437½	,,
16 Ounces	=	1 Pound	=	7000	,,

Precious Metals are usually sold by

TROY WEIGHT.

24 Grains	=	1 Pennyweight	=	24	Grains.
20 Pennyweights	=	1 Ounce	=	480	,,
12 Ounces	=	1 Pound	=	5760	,,

NOTE.—An ounce of *metallic* silver contains 480 grains, but an ounce of *nitrate* of silver contains only 437½ grains.

FRENCH WEIGHTS AND MEASURES,

AND THEIR EQUIVALENTS IN ENGLISH.

1 Cubic Centimètre	=	17 minims nearly.
3½ ,, ,,	=	1 drachm.
28·4 ,, ,,	=	1 ounce.
50 ,, ,,	=	1 ounce 6 drachms 5 minims.
100 ,, ,,	=	3 ounces 4 drachms 9 minims.
1000 ,, ,, or 1 litre, = to 61 cubic inches	=	35 ounces 1 drachm 36 minims.

The unit of French liquid measures is a cubic *centimètre.*

A cubic *centimètre* of water measures nearly 17 minims (16·896); it weighs 15·4 grains, or 1 *gramme.* A cubic *inch* of water weighs 252·5 grains.

The unit of French weights is the gramme = to 15·4 grains; thus a drachm (60 grains) is nearly 4 grammes (3·88). An easy way to convert grammes into English weight is to divide the sum by 4, which gives the equivalent in drachms very nearly thus:—

Grammes.				Drachms.		Oz.		Drachm.		Grains.
100	÷	4	=	25	=	3	.	1	+	43

APPLICATIONS FOR PATENTS CONNECTED WITH THE PHOTOGRAPHIC ART.

(*Corrected up to date of going to Press.*)

No. 15,661.—'Improvements in Photography and in Photographie Apparatus.' Communicated by G. Eastman. Complete specification. A. J. BOULT.—*Dated November* 30, 1886.

No. 15,810.—'Apparatus for the Manufacture of Photographic Plates.' W. J. WILSON.—*Dated December* 3, 1886.

No. 15,873.—'Improvements in Photographic and other Optical Apparatus.' Z. H. KINGDON.—*Dated December* 4, 1886.

No. 16,008.—'The Purpose of Producing a Method by which Photographic Portraits, Photographic Views, and other Portraits, Pictures, and Designs, Printed or Displayed on any Material whatsoever as Separate and Independent Articles, may be Inserted into and Removed from the Outsides of Lids of Fancy Boxes, Cases, or the Covers of Photographic Albums, and other Albums and Books, without Injury to the Articles Inserted or to the Articles Receiving the Same.' A. BASSANO.—*Dated December* 7, 1886.

No. 16,012.—'Improvements in Apparatus for Printing Photographic Pictures.' Communicated by Hans Brand. E. EDWARDS.—*Dated December* 7, 1886.

No. 16,021.—'Improvements in Photographic Apparatus for Topographic Purposes.' Communicated by Louis de Torres. A. J. BOULT.—*Dated December* 7, 1886.

No. 16,207.—'A New or Improved Device applied to Camera 'Backs' and the like for Ascertaining the Exposure of Negatives and for similar Purposes.' L. J.-B. GAUTIER.—*Dated December* 10, 1886.

No. 16,261.—'Improvements in and connected with Diaphragm Shutters for Photographic Lenses or Cameras.' J. M. ELLIOTT.—*Dated December* 11, 1886.

No. 16,327.— Improvements in and connected with Photography and the Treatment of Photographic Prints or Pictures.' J. URIE, SEN., and J. URIE, JUN.—*Dated December* 13, 1886.

No. 16,356.—'A Transparent Medley Photo-Paper for Producing Two or any Greater Number of Photographs combined in One Picture on One Piece of Paper.' G. J. SERSHALL.—*Dated December* 14, 1886.

No. 16,475.—'Process for Producing Lithographic and Typographic Formes from Photographs or other Designs.' M. WALKER, G. E. WALKER, and J. B. GERMEUIL-BONNAUD.—*Dated December* 15, 1886.

No. 16,476.—'Process for Producing from Photographic and other Designs Engraved Plates or Rollers for Printing.' M. WALKER, G. E. WALKER, and J. B. GERMEUIL-BONNAUD.—*Dated December* 15, 1886.

No. 16,605.—'Improvements in Photographic Apparatus.' Complete specification. H. COPPIN.—*Dated December* 17, 1886.

No. 369.—'Improvements in Printing Frames for Printing Photographs and the like.' Communicated by J. C. A. Hermite. J. Y. JOHNSON.—*Dated January* 10, 1887.

No. 725.—'An Appliance for Use when Changing or Transferring Photographic Dry Plates into Dark Slides.' L. T. MERRY.—*Dated January* 17, 1887.

No. 742.—'Improvements in the Production of Coloured Photographs." L. J. H. CELLERIER.—*Dated January* 17, 1887.

No. 973.—'Improvements in Apparatus for Holding, Exposing, and Removing Dry Plates or Films in Photographic Cameras.' M. E. T. SHERWILL. —*Dated January* 21, 1887.

No. 981.—'A New and Improved Method of Producing Coloured Transparencies.' F. W. OLIVER.—*Dated January* 21, 1887.

No. 1079.—'Improvements in Obtaining Prints with the Aid of Photography, and in the Preparation of the Materials, and in Apparatus to be employed therein.' G. RAYMOND.—*Dated January* 24, 1887.

No. 1465.—'Improvements in or connected with Photographic Cameras and the Sensitive Media for Exposure therein.' W. North and K. L. North.—*Dated January* 29, 1887.

No. 1830.—'Improvements in Bearings for Photographic Rolling Presses, Rolling Machines, and the like.' W. E. Moss and John Mitton.—*Dated February* 5, 1887.

No. 1875.—'A New or Improved Method of Regulating the Duration of the Exposure of Sensitive Plates to Light in Photographic Cameras.' J. Adams.—*Dated February* 7, 1887.

No. 1902.—'A Mode of Lighting Pictures, Coloured Prints, or Coloured Objects for the Purpose of Photographic Reproduction.' W. de W. Abney.—*Dated February* 7, 1887.

No. 2012.—'Improvements in Printing Artificial Skies by Photography on to Photographs.' G. J. Sershall.—*Dated February* 9, 1887.

No. 2024.—'Producing or Manufacturing Metallic Cameo Portraits.' M. Cobe.—*Dated February* 9, 1887.

No. 2042.—'Improvement in Photographic Cameras.' J. R. Gotz.—*Dated February* 9, 1887.

No. 2555.—'Improvements in Photographic Shutters.' W. D. Richmond.—*Dated February* 18, 1887.

No. 2634.—'An Improved Photographer's Lantern.' F. Bishop.—*Dated February* 19, 1887.

No. 2662.—'Improved Photographic Film Paper.' L. Warnerke and Silverhouse.—*Dated February* 21, 1887.

No. 2736.—'Improved Means for Attaching or Detaching the Tripods or Supports of Photographic Cameras.' H. Bolden.—*Dated February* 22, 1887.

No. 2737.—'Improvements in Camera Stands or Supports and in Means for Attaching Cameras thereto.' H. Bolden.—*Dated February* 22, 1887.

No. 2748.—'Improvements in Photographic Camera Stands.' Communicated by E. Calix-Toussaint. M. O. HUND, trading as SAHL & Co.—*Dated February* 22, 1887.

No. 2803.—'An Improved Back for Photograph and Mirror Frames.' W. D. WILKINSON and F. FOWLER.—*Dated February* 23, 1887.

No. 2891.—'Improvements in Photographic Albums.' C. LUNN.—*Dated February* 24, 1887.

No. 3096.—'Improvements in Photographic Cameras.' J. E. BROWN.—*Dated February* 28, 1887.

No. 3139.—'Improvements in Photography and Photographic Reproduction.' Communicated by Albert Sichel. Complete specification. A. J. BOULT.—*Dated March* 1, 1887.

No. 3178.—'An Improved Substitute for Glass for Photographic and other Purposes, and Apparatus in connexion with the Manufacture thereof.' J. E. THORNTON.—*Dated March* 2, 1887.

No. 3235.—'Improvements in Photograph and similar Albums and Frames.' Complete specification. C. F. FRÄNZEL.—*Dated March* 2, 1887.

No. 3270.—'An Improved Photographic Camera Stand.' J. LANDER.—*Dated March* 3, 1887.

No. 3393.—'Improved Means for Enabling Unskilled Persons to Produce Artistically Coloured Pictures.' W. H. MAY.—*Dated March* 5, 1887.

No. 3449.—'An Invention by which Pictures, Photographs, or Frames containing Works of Art or other Materials for Exhibition can be Hung to the Wall by Ordinary Picture Rods or Nails.' H. DAY.—*Dated March* 7, 1887.

No. 3580.—'Improvements in the Manufacture of Sensitive Photographic Films and in Apparatus therefor.' Communicated by G. Eastman. A. J. BOULT.—*Dated March* 8, 1887.

No. 3652.—'The Keeping Count of the Number of Prints Printed and to Print from Photographic Negatives.' N. S. BROWN.—*Dated March* 10, 1887.

No. 3922.—'Improvements in Instantaneous Shutters.' J. R. GOTZ.—*Dated March* 15, 1887.

No. 3998.—'An Improved Apparatus for the Application of Electric Light for Photographic Purposes.' F. J. Chary.—*Dated March* 16, 1887.

No. 4178.—'An Improved Construction of Rotary Album suitable for Photographs, Memoranda, and the like.' Complete specification. T. W. Nagington and W. H. Waring.—*Dated March* 19, 1887.

No. 4586.—'A New or Improved Holder for Photographic Plates.' E. H. White.—*Dated March* 28, 1887.

No. 4718.—'An Improved Photographic Camera.' C. Cusworth.—*Dated March* 30, 1887.

No. 4725.—'Improvements in Focussing Arrangements for Photographic Cameras.' T. N. Armstrong and G. Mason.—*Dated March* 30, 1887.

No. 4804.—'Improvements in Slide Carriers for Automatically Centering and Quickly Changing Slides in Magic Lanterns.' Complete specification.—W. J. Coles.—*Dated March* 31, 1887.

No. 4808.—'Regulating and Fixing the Horizontal or Vertical Swing of Photographic Cameras.' C. Sands and J. J. Hunter.—*Dated March* 31, 1887.

No. 5308.—'Improvements in Giving Rigidity to Flexible Photographic Films.' S. H. Fry.—*Dated April* 12, 1887.

No. 5488.—'Improvements in Holders, Clips, or Easel for Photographs, Mirrors, Photograph Frames, Cards, and other Articles.' H. Whitfield.—*Dated April* 15, 1887.

No. 5772.—'Improved Photographic Mounting Cards.' L. Wolff.—*Dated April* 20, 1887.

No. 5797.—'Portable Photographic Camera for Long and Short Focus Lenses.' W. J. Smith.—*Dated April* 21, 1887.

No. 5798.—'An Improved Process of Moulding the Impressions of Blocks, Electrotypes, or Zincographs, for Stereotype Plates.' J. Caprani.—*Dated April* 21, 1887.

No. 5812.—'An Improved Photograph or Picture Holder.' W. D. WILKINSON and F. FOWLER.—*Dated April* 21, 1887.

No. 5843.—'Improvements in Photographic Cameras.' H. H. CUNYNGHAME.—*Dated April* 21, 1887.

No. 5902.—'Improvements in Photographic Lenses.' T. R. DALLMEYER.—*Dated April* 22, 1887.

No. 5903.—'Improvements in what are known as Instantaneous Photographic Shutters.' T. R. DALLMEYER and F. BEAUCHAMP.—*Dated April* 22, 1887.

No. 5923.—'Controlling the Action of Instantaneous Photographic Shutters with Detent Spring.' G. S. MARTIN.—*Dated April* 23, 1887.

No. 5966.—'Improvements in Albums for Photographs.' Complete specification. H. A. M. DITTMAR.—*Dated April* 23, 1887.

No. 6032.—'Improvements in Apparatus for Preserving and Changing Sensitive Plates used in Producing Photographic Pictures.' Communicated by Messrs. Koppe & Moh. E. EDWARDS.—*Dated April* 25, 1887.

No. 6076.—'Improvement in Photographic Cameras.' Complete specification. W. CLARK.—*Dated April* 26, 1887.

No. 6082.—'A New or Improved Camera Obscura for Use in Taking Views and the like.' S. ANDREWS and F. E. ANDREWS.—*Dated April* 26, 1887.

No. 6249.—'An Improved Metallic Stand or Frame for Holding Views, Photos, Advertising Tablets, and any such like Articles.' J. A. RICHARDS.—*Dated April* 29, 1887.

No. 6331.—'Improvements in Apparatus for Holding and Exposing Sensitised Films, or Paper, or other Flexible Substance in Photographic Cameras.' C. D. DURNFORD.—*Dated April* 30, 1887.

No. 6353.—'An Improved Appliance for Use in Treating and Washing Photographic Prints and Plates.' The Hon. W. GRIMSTON.—*Dated April* 30, 1887.

No. 6613.—'An Improved Detective Camera for Artists.' S. W. ROUCH.—*Dated May* 5, 1887.

No. 6673.—'Improvements in Photographic Instruments.' Communicated by J. R. Connon. Complete specification. A. J. Boult.—*Dated May* 6 1887.

No. 6791.—'Improvements in the Method of Mounting and Manipulating Backgrounds for Photographic Operations, and in Apparatus therefor.' C. Brunner.—*Dated May* 9, 1887.

No. 7035.—'An Improved Magnesium Light for Photographic Purposes.' Complete specification. J. Gaedicke and A. Miethe.—*Dated May* 13, 1887.

No. 7121.—'Improvements in the Method of Focussing the Object Glasses of Cameras and in Apparatus therefor.' Communicated by L. M. Berthon. G. Downing.—*Dated May* 16, 1887.

Nos. 7372 and 7374.—'Improvements in the Manufacture or Production of Blocks or Plates for Printing from.' C. Klîc and L. Collardon.—*Dated May* 20, 1887.

No. 7390.—'Improvements in Magic Lanterns and Apparatus connected therewith.' A. Schanschieff.—*Dated May* 20, 1887.

No. 7464.—'A Phantom Photographic Camera which Dispenses with the Necessity of Using a Base Board for the Support of the Front Board and other Parts of a Camera.' T. Prescott.—*Dated May* 23, 1887.

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No. 7737.—'An Improved Method and Apparatus for Photographic Printing.' J. Harrington.—*Dated May* 27, 1887.

No. 8132.—'Improvements in Photographic Apparatus.' Communicated by M. Carquero. E. De Pass.—*Dated June* 6, 1887.

No. 8281.—'Registering the Exposures of Sensitised Films as used in Roll Holders for Photography.' W. Rogers.—*Dated June* 9, 1887.

No. 8374.—'Holding Photographic Films and Changing the Same, and for Holding Dry Plates.' G. V. J. Poirin.—*Dated June* 10, 1887.

No. 8472.—'Improvements in Photographic Dark Slides. W. MIDDLEMISS. —*Dated June* 13, 1887.

No. 8493.—'Improvements in Protectors, Cases, or Wrappers for Cards, Photographs, Books, Samples, Patterns, and the like, during Transmission through the Post.' G. A. HEARN.—*Dated June* 13. 1887.

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No. 8711.—'Improvements in Apparatus for Regulating Exposures in the Use of Photographic Shutters.' T. R. DALLMEYER and F. BEAUCHAMP.—*Dated June* 16, 1887.

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No. 9159.—'Improved Process for Producing Grained Relief and Intaglio Clichés from Photographs.' J. BARTOS and H. KÜHN.—*Dated June* 28, 1887.

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No. 9304.—'An Efficient Photographic Instantaneous Shutter.' W. E. KERSLAKE.—*Dated June* 30, 1887.

No. 9341.—'Improvements in Combined Changing Boxes and Dark Slides for Photographic Purposes, and in Portable Dark Chambers for use therewith.' A. PUMPHREY.—*Dated July* 1, 1887.

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No. 9954.—'Improvements in Photographic Cameras and in the Shutters therefor.' A. RAYMENT.—*Dated July* 15, 1887.

No. 10,247.—'An Appliance to Facilitate the Accurate Placing in Albums of Photographs, Drawings, or Scraps.' W. G. GREENWOOD.—*Dated July* 22, 1887.

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No. 12,168.—'A New or Improved Process for Obtaining Positive Black Ink Copies from Positive Tracings or Negatives by the Action of Light.' G. BAY. —*Dated September* 8, 1887.

No. 12,191.—'Improvements in Shutters for Photographic Cameras and in the Mechanism for Actuating such Shutters.' A. S. NEWMAN.—*Dated September* 8, 1887.

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No. 12,292.—'Improvements in Washing Photographic Prints and in Apparatus therefor.' A. MARRIOTT.—*Dated September* 10, 1887.

No. 12,521.—'Improvements in the Preparation of Films for Photographic Purposes in Monochrome or Polychrome.' J. BROWN.—*Dated September* 15, 1887.

No. 12,608.—'Photo Etching, that is to say, an Invention for the Production by Photography of Portraits or Pictures having the Characteristics of Copperplate Etchings.' M. M. SCOTT and T. SCOTT.—*Dated September* 17, 1887.

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No. 12,894.—'An Improvement in an Instrument to Show the Focus of Convex and Concave Lenses.' J. ANDERTON.—*Dated September* 23, 1887.

No. 12,940.—'Improvements in Photographic Shutters.' F. W. BRANSON. —*Dated September* 24, 1887.

No. 13,186.—'Improvements in and connected with Diaphragms and Shutters for Photographic and other Lenses or Cameras.' J. M. ELLIOT.—*Dated September* 29, 1887.

No. 13,332.—'An Improved Photometer for Measuring Intensity of Light in the Photographic Camera.' J. DECOUDUN.—*Dated October* 1, 1887.

No. 13,505.—'Improvements in Apparatus for Washing and Drying Photographic Negatives and Photographic Pictures on Glass, Part of such Improvements being applicable also for Washing Photographic Prints.' J. H. JEFFERIES.—*Dated October* 5, 1887.

No. 13,566.—'Improvement in Instruments or Cameras for Photographing Distant or other Objects.' R. BIRD.—*Dated October* 6, 1887.

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No. 14,684.—'Improvements in or connected with Photography.' G. T. Holloway.—*Dated October* 28, 1887.

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No. 15,153.—'An Improved Method of Adjusting the Front Slides of Photographic Cameras.' R. Overton.—*Dated November* 7, 1887.

For Contents, *see p.* 565.
For Formulæ, *see p.* 517.
For Index to Advertisers, *see p.* 583.
For Postal and Telegraphic Addresses, *see p.* 688.

CONTENTS.

[*See following pages.*

[*See preceding and following pages.*

[*See preceding pages.*

SEE PAGE 579.

For Contents, *see p.* 565.

For Postal and Telegraphic Addresses, *see pp.* 688, 689.

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For POSTAL AND TELEGRAPHIC ADDRESSES, *see pp.* 688, 689.

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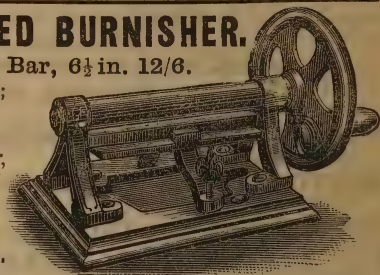

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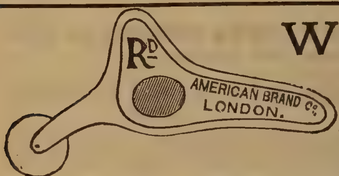

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2	6 × 5	1⅜	11	3	5	0
			14	3	15	0
3	8½ × 6½	1½	14	4	1	0
			16	4	10	0
4	9 × 7	1¾	16	4	10	0
			18	4	15	0
5	10 × 8	2	18	4	19	0
			20	5	9	0

No.	Size of Plate.	Diam. of Lenses.	Equivalent Focus.	Price. £	s.	d.
	Inches.	Inches.	Inches.	£	s.	d.
6	12 × 10	2⅛	20	6	6	0
			22	6	16	0
7	13 × 11	2¼	22	7	0	0
8	15 × 12	2½	25	7	19	0
9	18 × 16	2¾	28	9	0	0
10	22 × 18	3	31	12	12	0
11	25 × 22	3½	34	17	2	0
12	28 × 24	4	38	20	0	0

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No.	Size of Plate.	Diam. of Lenses.	Equivalent Focus.	Price. £	s.	d.
	Inches.	Inches.	Inches.	£	s.	d.
1	5 × 4	1⅜	5¼	2	19	0
2	7¼ × 4½	1⅝	7	3	5	0
3	8½ × 6½	1⅞	8½	4	1	0
4	10 × 8	2⅛	10	4	19	0
5	12 × 10	2½	12	6	6	0

No.	Size of Plate.	Diam. of Lenses.	Equivalent Focus.	Price. £	s.	d.
	Inches.	Inches.	Inches.	£	s.	d.
6	15 × 12	2⅝	15	7	19	0
7	18 × 16	3	18	9	9	0
8	22 × 20	3⅝	22	12	12	0
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